6627TT "6858760

FIG. 1

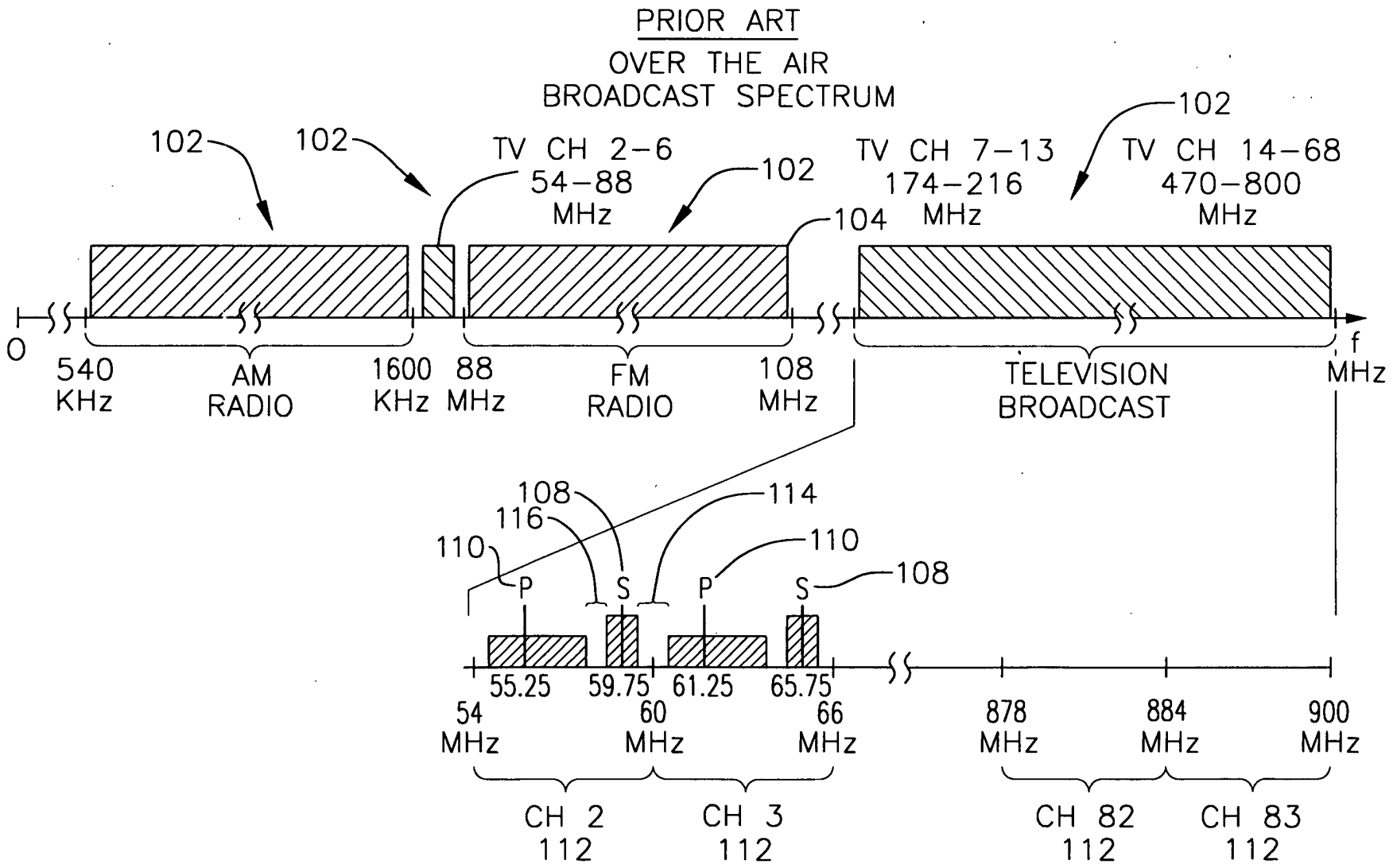


FIG.2

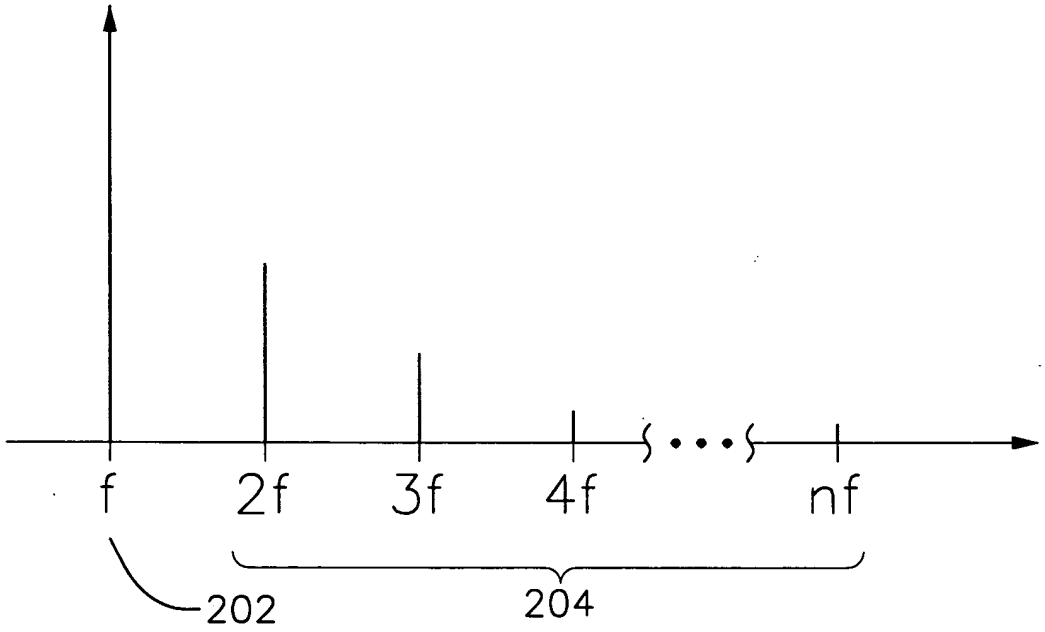
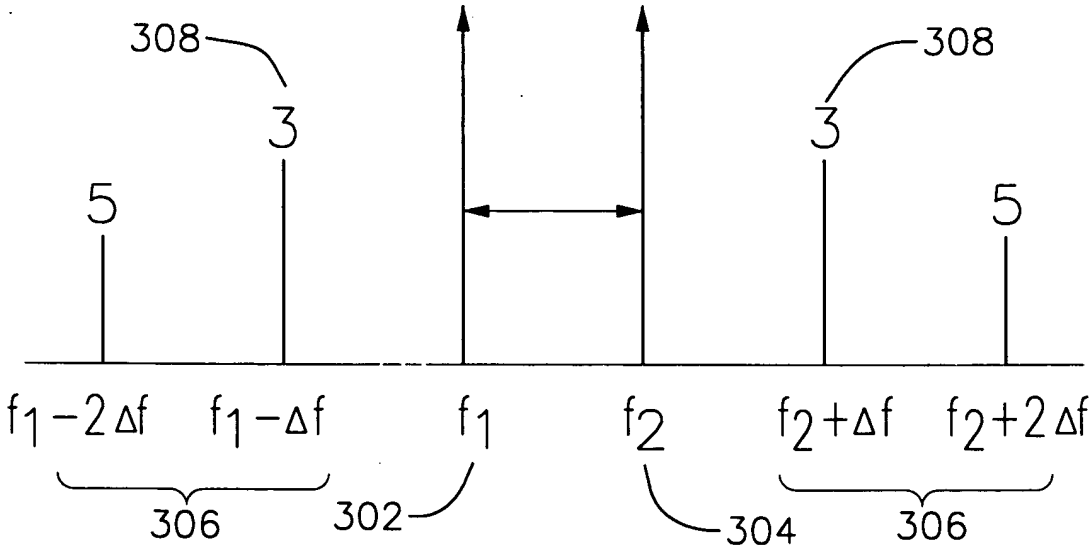


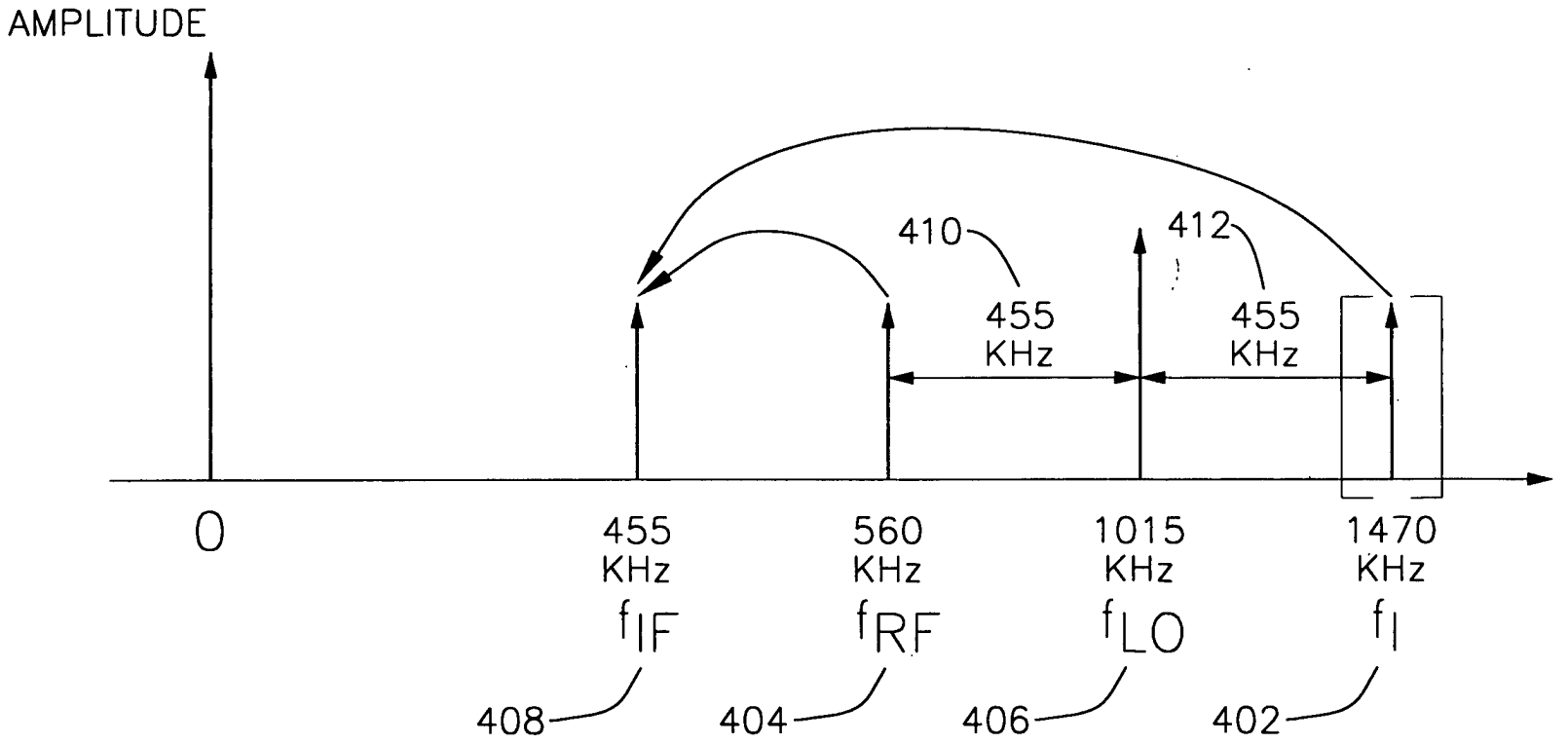
FIG.3

PRIOR ART



6627TT "6898760

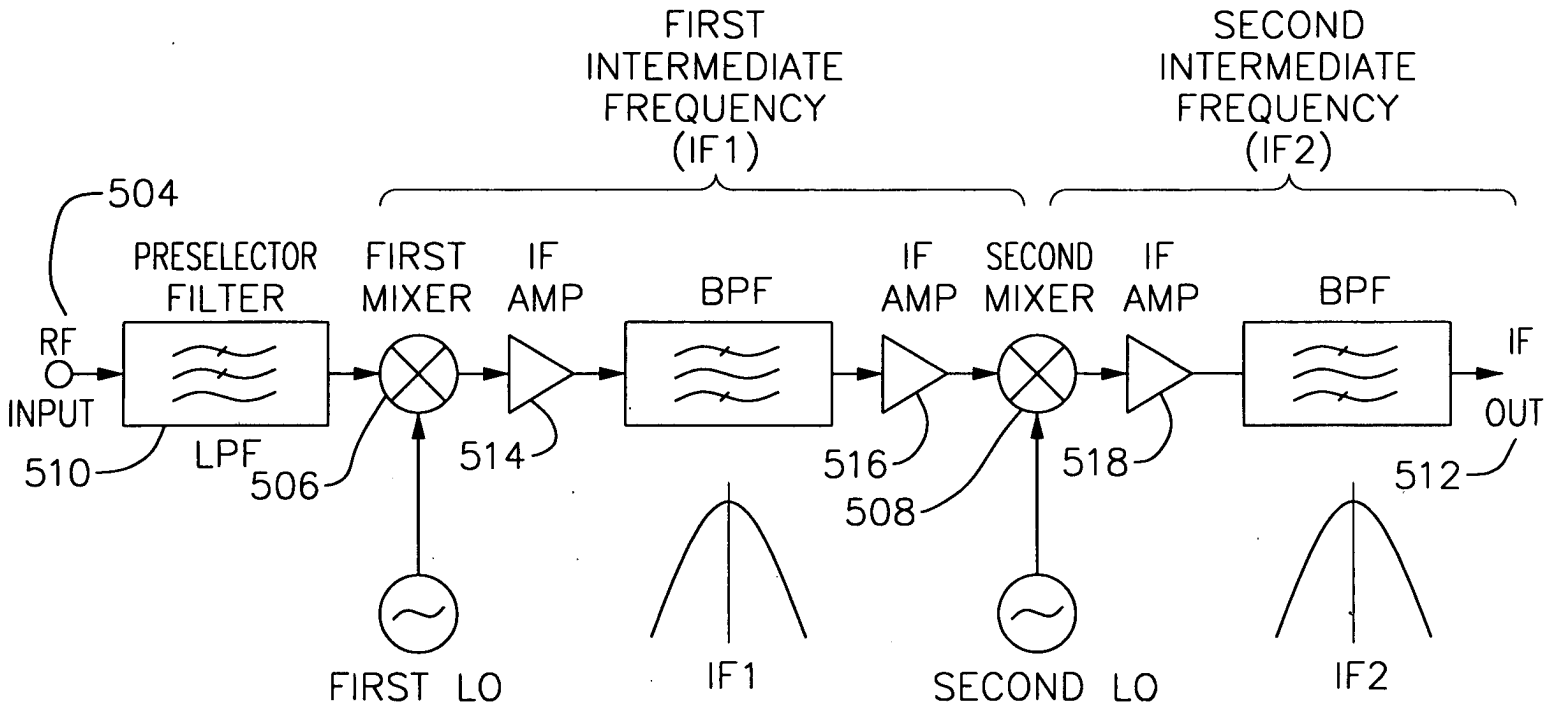
FIG. 4
PRIOR ART



6627TT: 6898760

FIG.5

DUAL CONVERSION RECEIVER



IF2<RFINPUT<IF1

FIG. 6

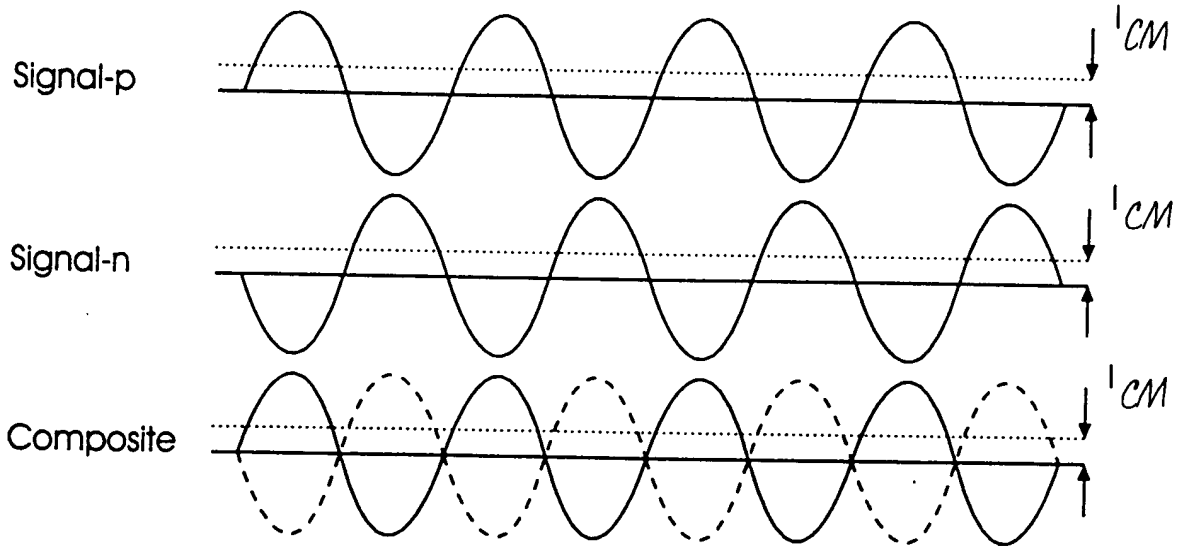

Signal-p
Signal-n
Composite
1 CM
1 CM
1 CM

FIG. 7

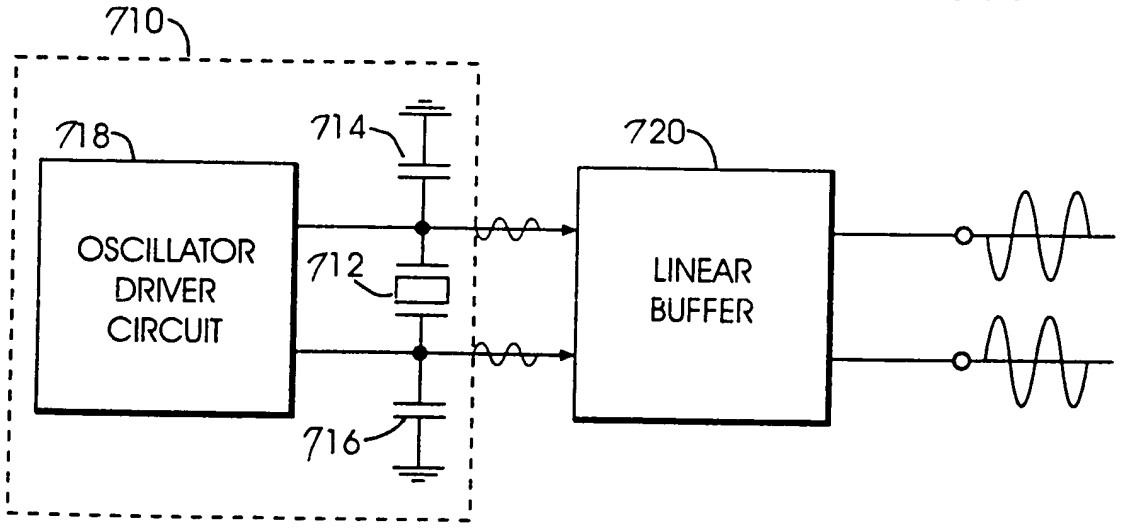

710
718
714
720
OSCILLATOR DRIVER CIRCUIT
712
LINEAR BUFFER
716

FIG. 8

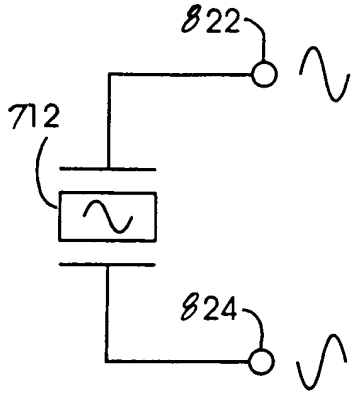


FIG. 9

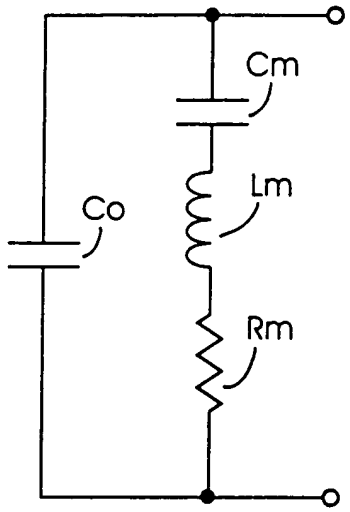


FIG. 10

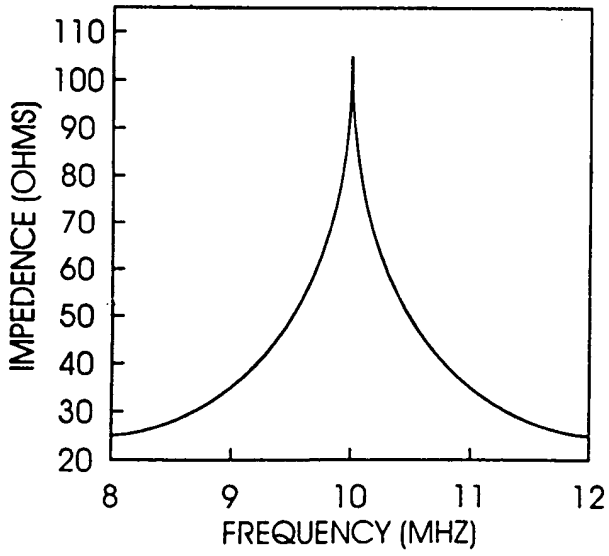
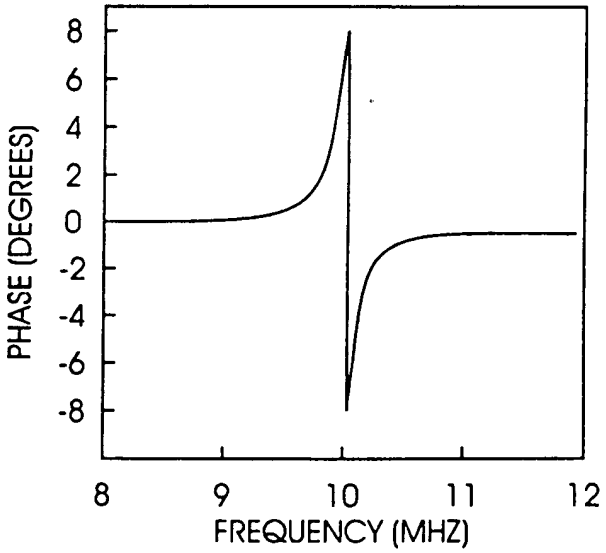


FIG. 11



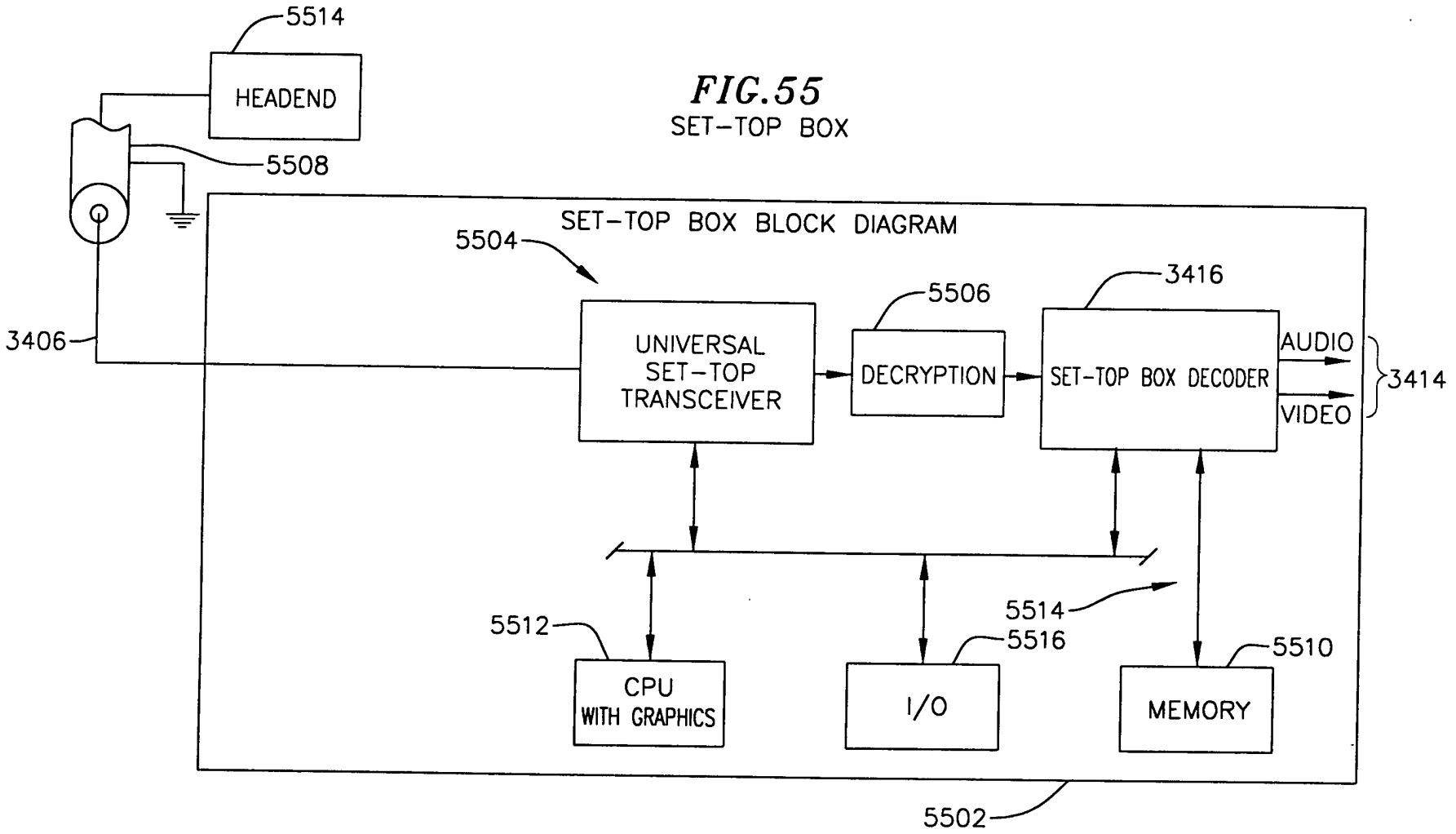


FIG.55
SET-TOP BOX

FIG.56

TELEVISION

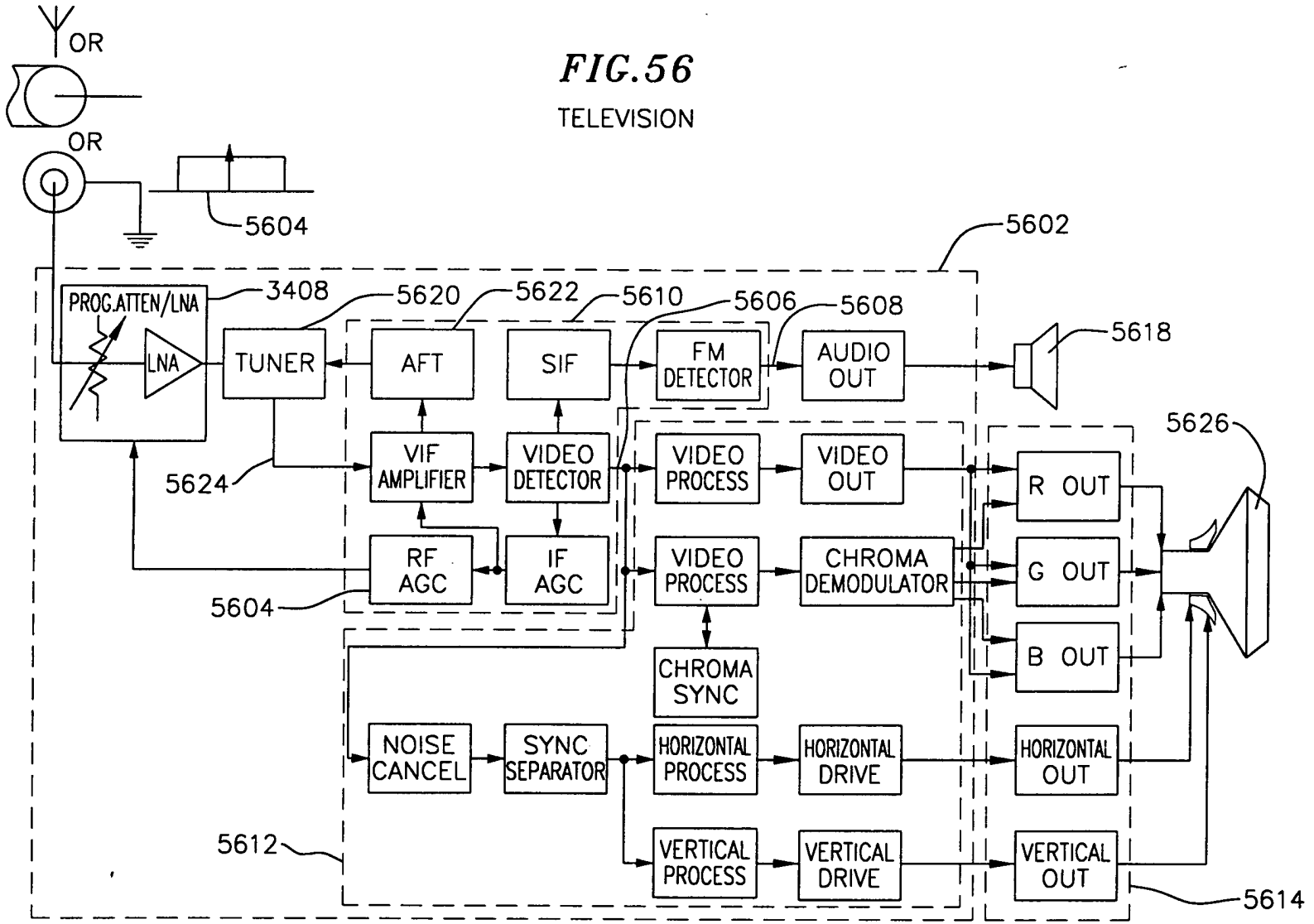


FIG.57

VCR BLOCK DIAGRAM

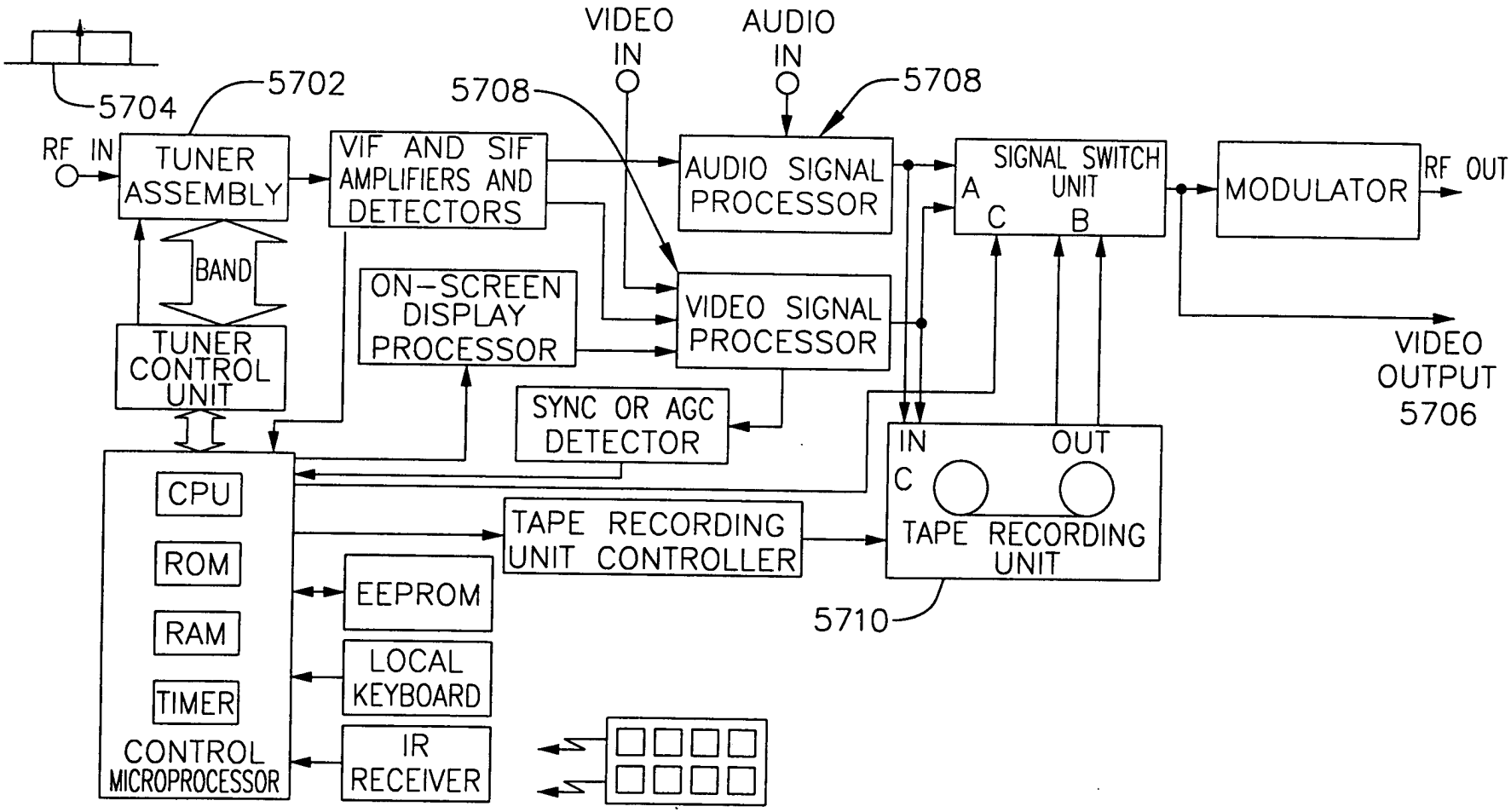


FIG.58

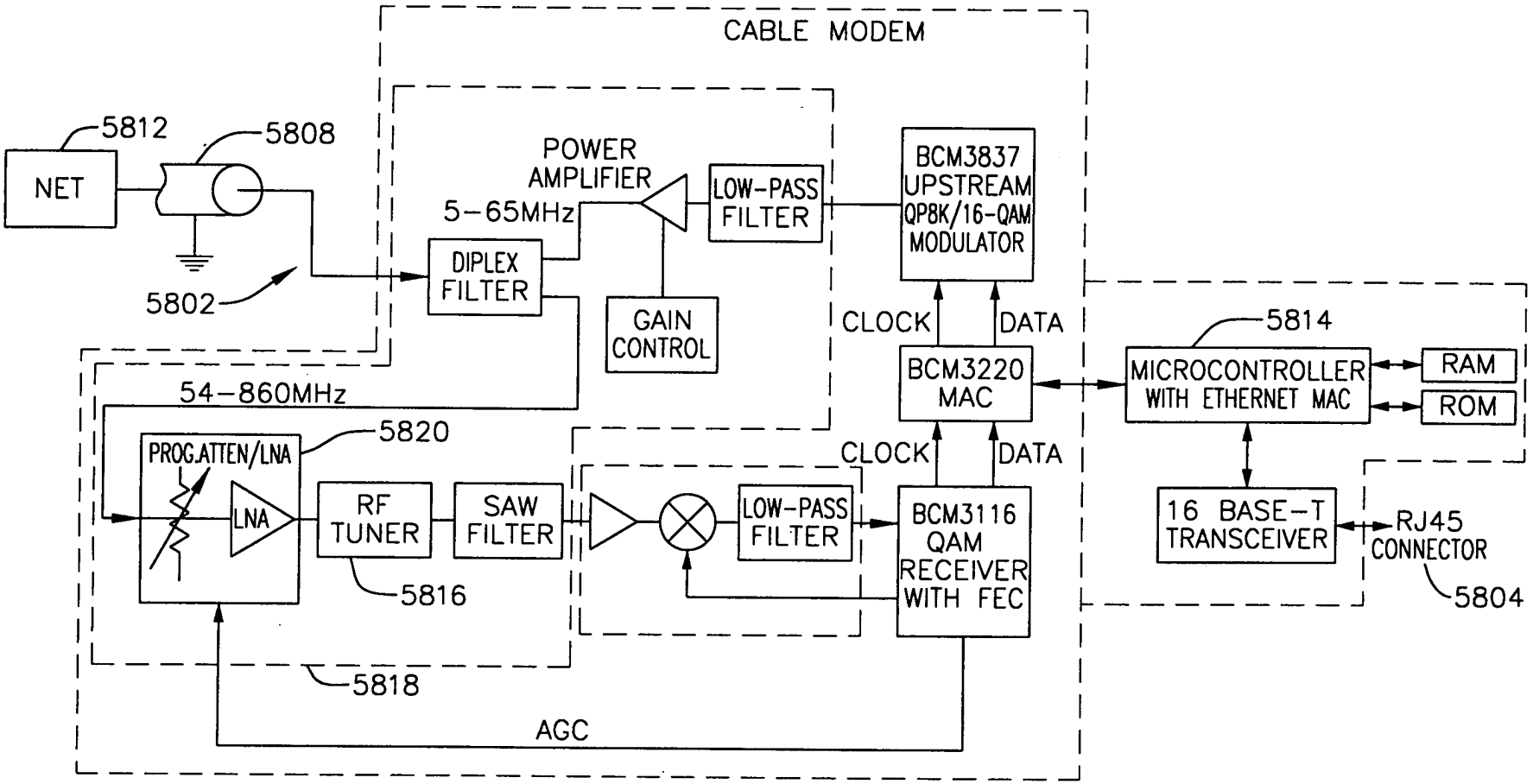

CABLE MODEM
5812
5808
NET
5802
POWER AMPLIFIER
5-65MHz
DIPLEX FILTER
GAIN CONTROL
LOW-PASS FILTER
BCM3837 UPSTREAM QP8K/16-QAM MODULATOR
CLOCK
DATA
5814
BCM3220 MAC
MICROCONTROLLER WITH ETHERNET MAC
RAM
ROM
54-860MHz
5820
PROG.ATTEN/LNA
LNA
RF TUNER
SAW FILTER
LOW-PASS FILTER
BCM3116 QAM RECEIVER WITH FEC
16 BASE-T TRANSCEIVER
RJ45 CONNECTOR
5804
5816
5818
AGC

FIG. 12

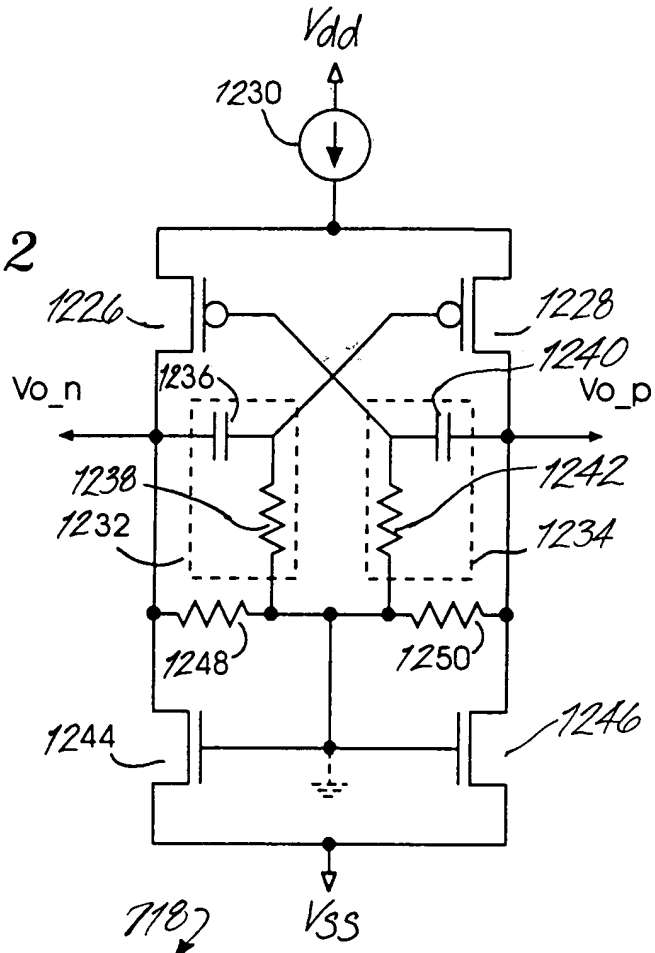

Vdd
1230
1226
1228
1240
Vo_n
1236
Vo_p
1238
1242
1232
1234
1248
1250
1244
1246
Vss

FIG. 13

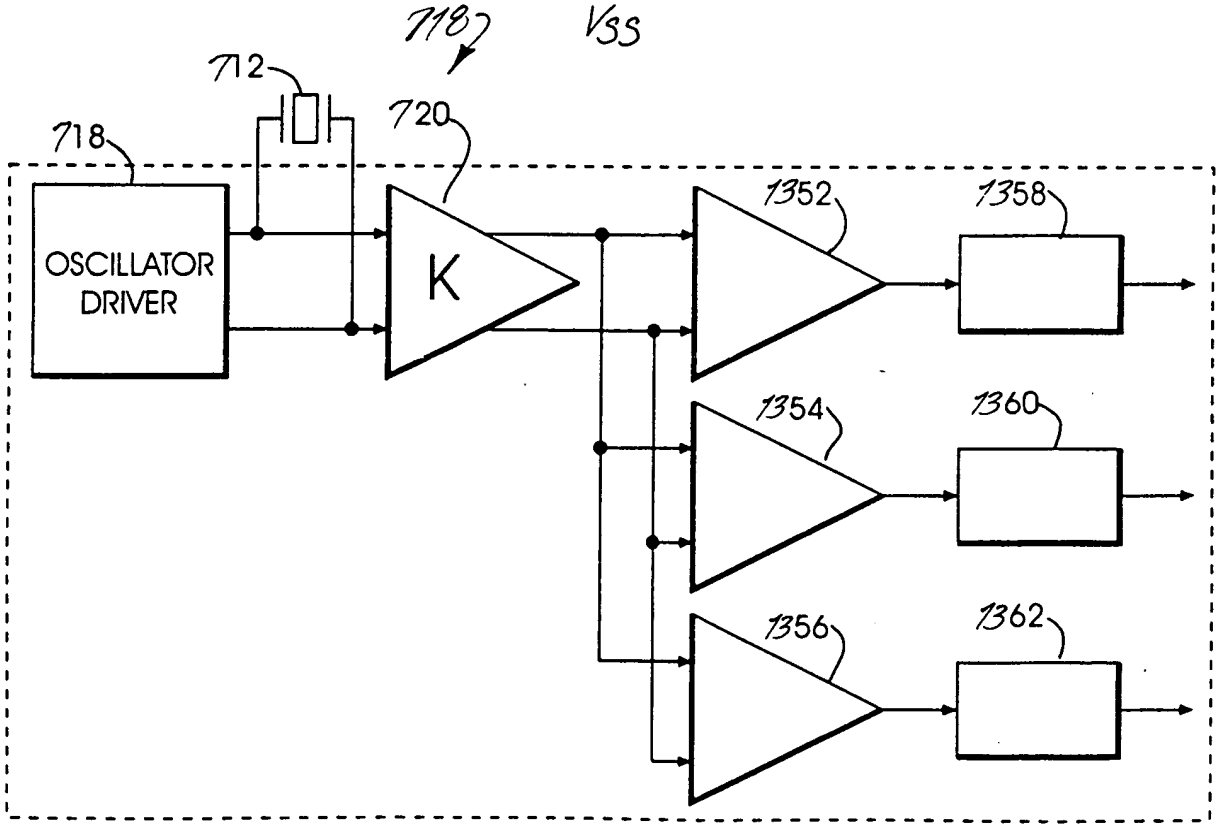
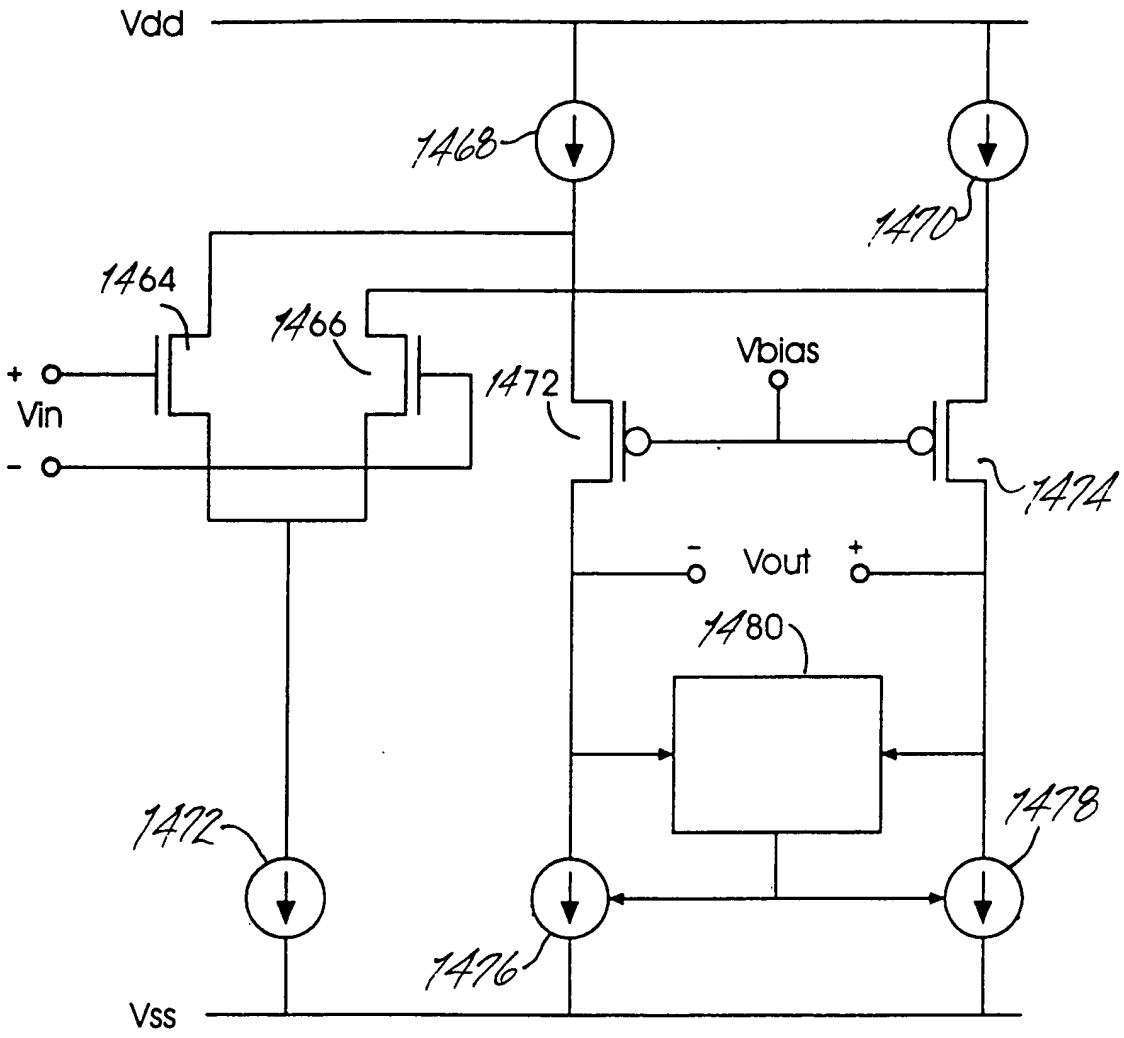

718
712
720
718
OSCILLATOR DRIVER
K
1352
1358
1354
1360
1356
1362

FIG. 14


Vdd
1468
1470
1464
1466
Vbias
+
Vin
-
1472
1474
-
Vout
+
1480
1472
1478
1476
Vss

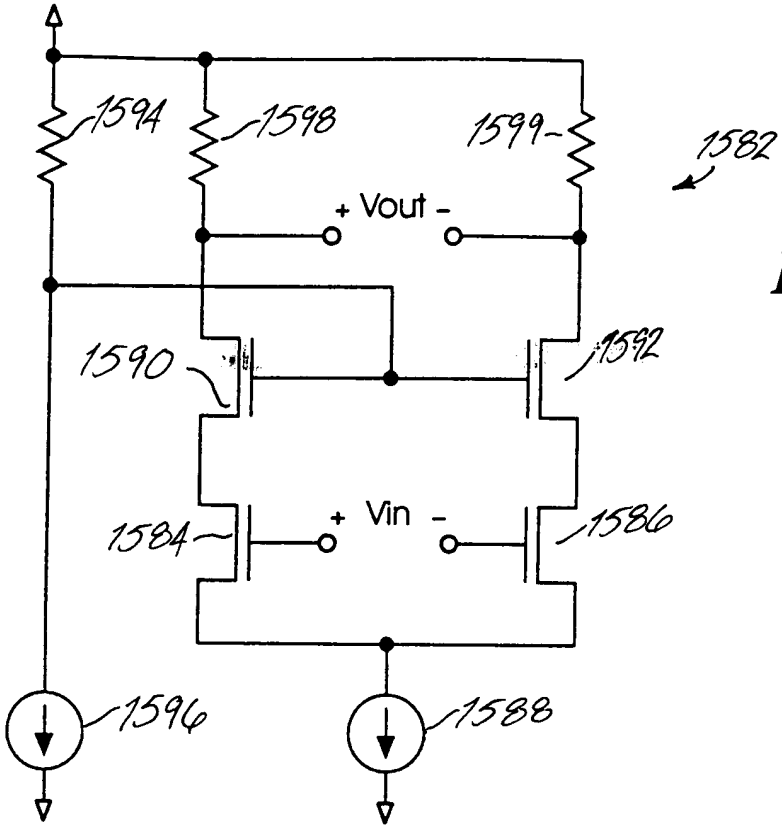

1594
1598
1599
1582
+ Vout -
1590
1592
+ Vin -
1584
1586
1596
1588

FIG. 15

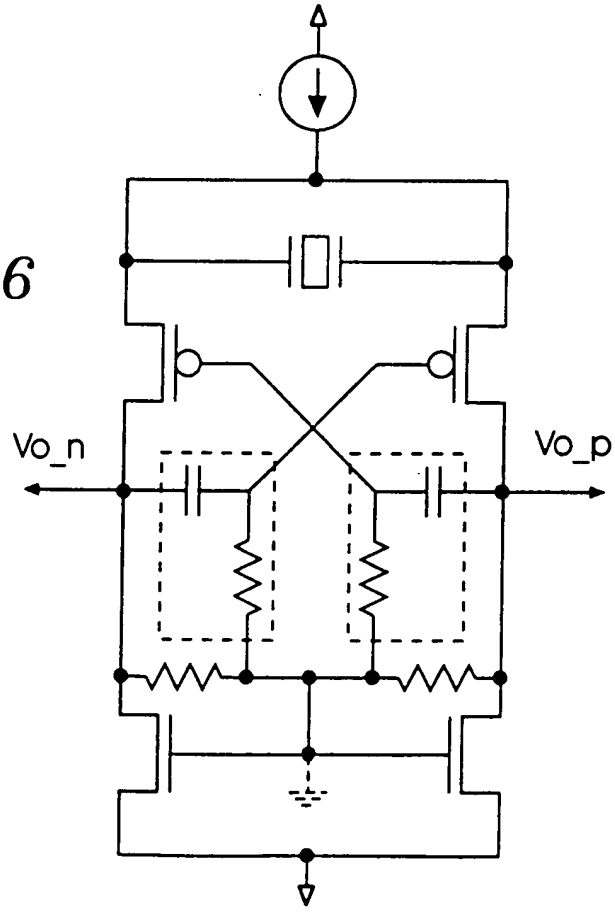

Vo_n
Vo_p

FIG. 16

FIG. 17

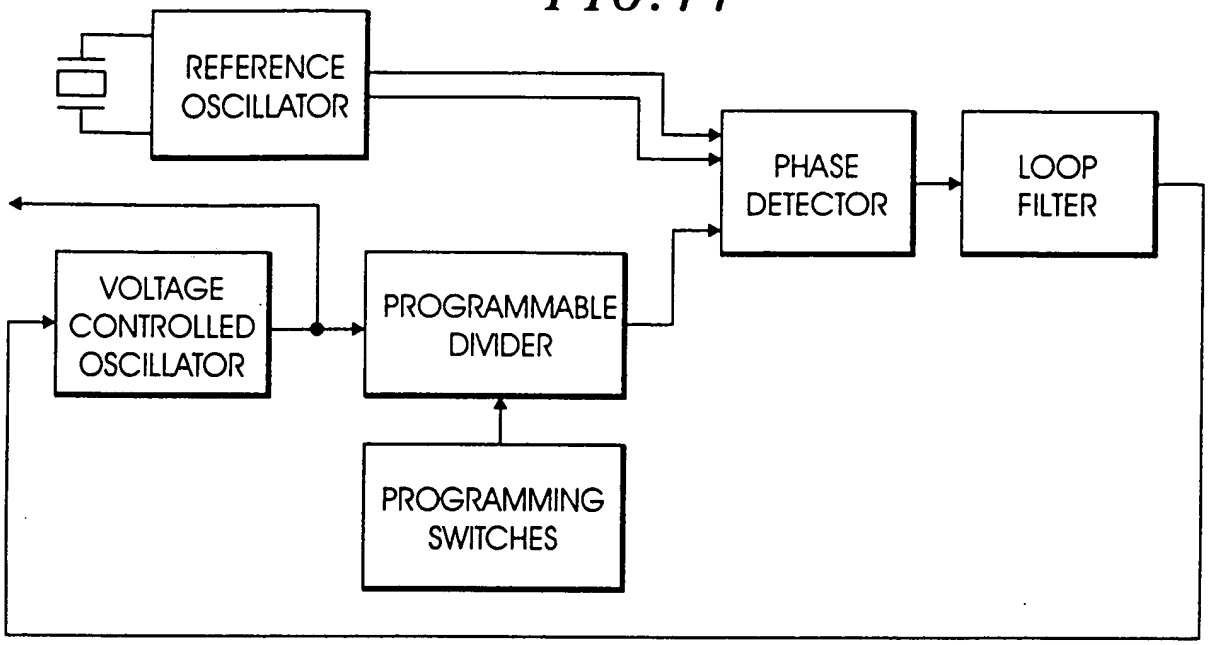

REFERENCE OSCILLATOR
PHASE DETECTOR
LOOP FILTER
VOLTAGE CONTROLLED OSCILLATOR
PROGRAMMABLE DIVIDER
PROGRAMMING SWITCHES

FIG. 18

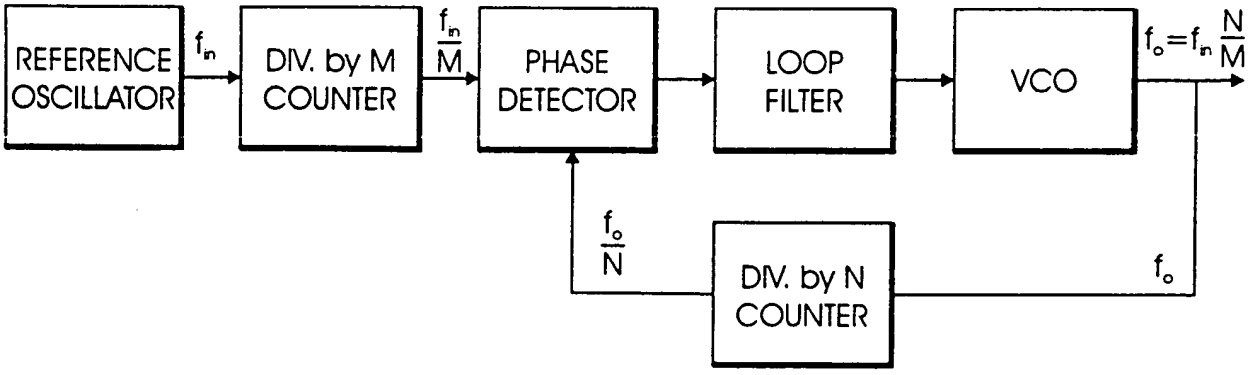
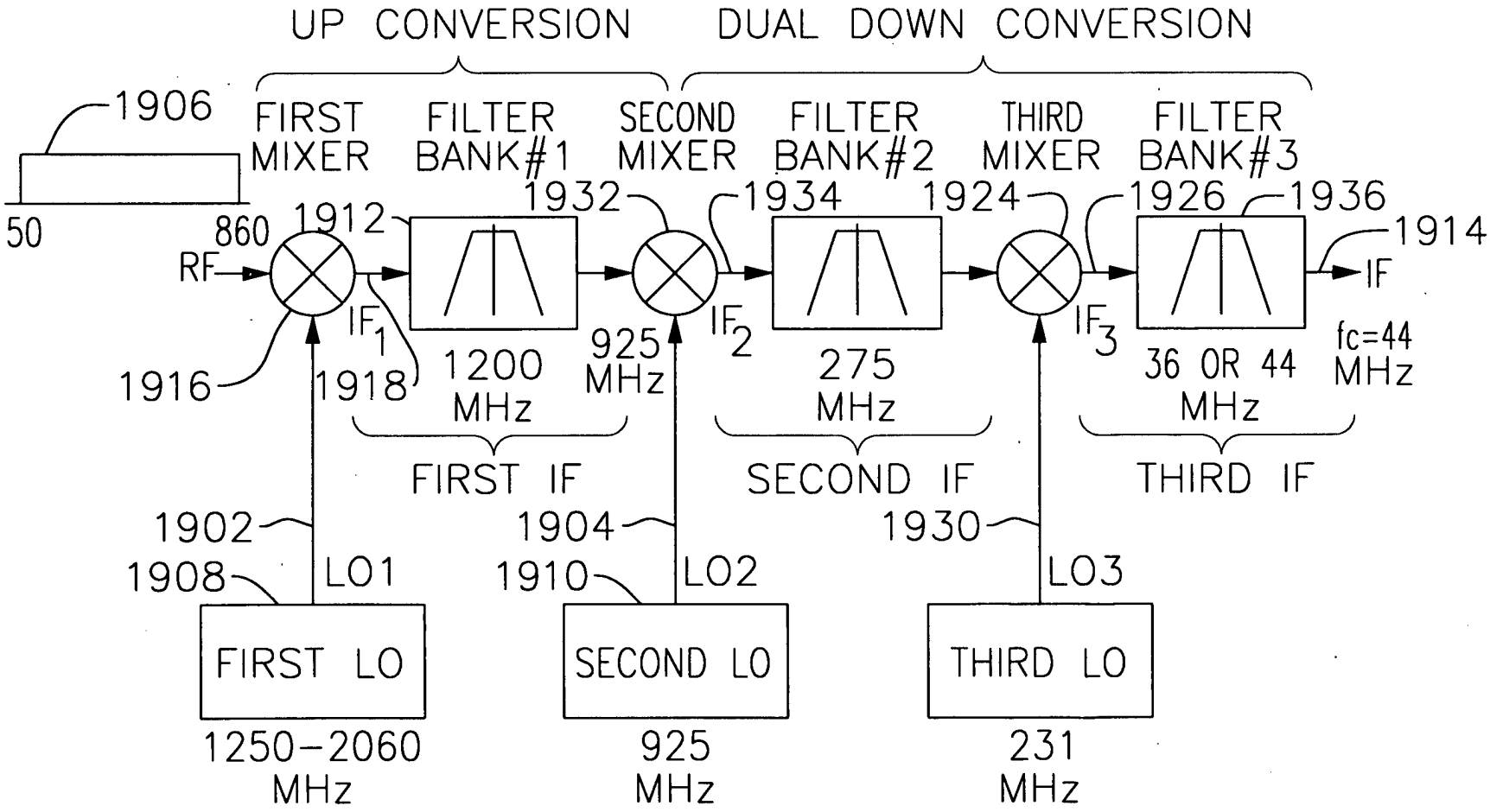
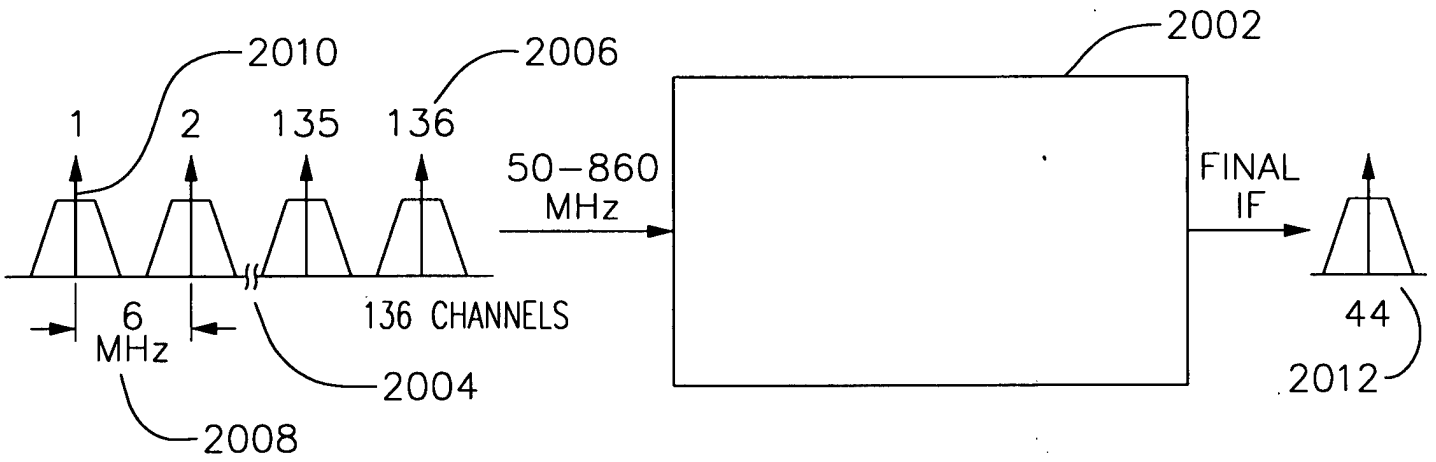

REFERENCE OSCILLATOR
f_{in}
DIV. by M COUNTER
$\frac{f_{in}}{M}$
PHASE DETECTOR
LOOP FILTER
VCO
$f_o = f_{in} \frac{N}{M}$
$\frac{f_o}{N}$
DIV. by N COUNTER
f_o

FIG. 19


UP CONVERSION
DUAL DOWN CONVERSION
1906
FIRST MIXER
FILTER BANK#1
SECOND MIXER
FILTER BANK#2
THIRD MIXER
FILTER BANK#3
50
860
RF
1912
1932
1934
1924
1926
1936
1914
IF
IF1
IF2
IF3
1916
1918
1200 MHz
925 MHz
275 MHz
36 OR 44 MHz
fc=44 MHz
FIRST IF
SECOND IF
THIRD IF
1902
1904
1930
1908
LO1
1910
LO2
LO3
FIRST LO
SECOND LO
THIRD LO
1250–2060 MHz
925 MHz
231 MHz

6627TT" 6698E060

FIG.20



6621FF 6838E60

FIG.21

PPL Xtal REFERENCE=10MHz
LO-1, 10MHz FREQUENCY STEPS
LO-2, 100kHz FREQUENCY STEPS

44MHz IF

TABLE OF FREQUENCIES BASED ON COARSE/FINE PLL SOLUTION:

NOTE
- LO-2 REF=100KHz, SO DIVIDE RANGE=9216 TO 9280

Frf (MHz)	50	56	62	68	74	80	86	92	98	104	110	116	122	128	"	854	860
LO-1(MHz)	1250	1260	1260	1270	1270	1280	1290	1290	1300	1300	1310	1320	1320	1330	"	2050	2060
IF-1 (MHz)	**1200**	1204	1198	1202	1196	**1200**	1204	1198	1202	1196	**1200**	1204	1198	1202	"	1196	**1200**
LO-2(MHz)	**924.8**	928.0	923.2	926.4	921.6	**924.8**	928.0	923.2	926.4	921.6	**924.8**	928.0	923.2	926.4	"	921.6	**924.8**
IF-2(MHz)	**275.2**	276.0	274.8	275.6	274.4	**275.2**	276.0	274.8	275.6	274.4	**275.2**	276.0	274.8	275.6	"	274.4	**275.2**
LO-3(MHz)	231.2	232	230.8	232	230	231	232	231	232	230	231	232	231	232	"	230	231
IF-3(MHz)	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	"	44.0	44.0

2102

FIG.22

PPL Xtal REFERENCE=10MHz
LO-1, 10MHz FREQUENCY STEPS
LO-2, 100kHz FREQUENCY STEPS

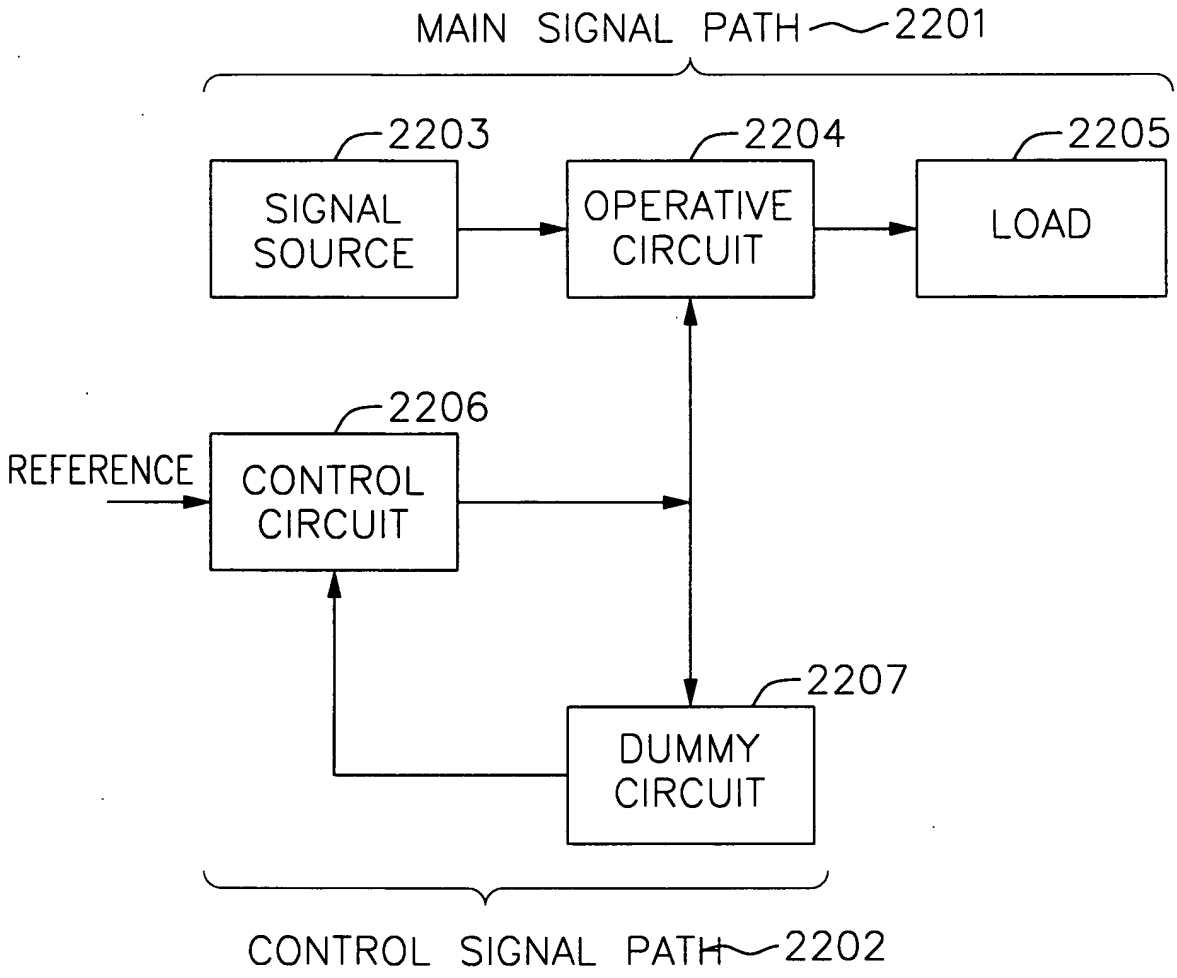
36MHz IF

TABLE OF FREQUENCIES BASED ON COARSE/FINE PLL SOLUTION:

NOTE
- LO-2 REF=100KHz, SO DIVIDE RANGE=9280 TO 9340

Frf (MHz)	50	58	66	74	82	90	98	106	114	122	130	138	146	154	"	852	860
LO-1(MHz)	1250	1260	1270	1270	1280	1290	1300	1310	1310	1320	1330	1340	1350	1350	"	2050	2060
IF-1 (MHz)	**1200**	1202	1204	1196	1198	**1200**	1202	1204	1196	1198	**1200**	1202	1204	1196	"	1198	**1200**
LO-2(MHz)	**931.2**	**932.8**	**934.4**	**928.0**	**930**	**931**	**933**	**934**	**928.0**	**930**	**931**	**933**	**934**	**928.0**	"	**929.60**	**931.2**
IF-2(MHz)	**268.8**	269.2	269.6	268.0	268.4	**268.8**	269.2	269.6	268.0	268.4	**268.8**	269.2	269.6	268.0	"	268.4	**268.8**
LO-3(MHz)	232.8	233.2	233.6	232	232	233	233	234	232	232	233	233	234	232.0	"	232.4	232.8
IF-3(MHz)	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	"	36.0	36.0

FIG.23


MAIN SIGNAL PATH
2201
2203
2204
2205
SIGNAL SOURCE
OPERATIVE CIRCUIT
LOAD
2206
REFERENCE
CONTROL CIRCUIT
2207
DUMMY CIRCUIT
CONTROL SIGNAL PATH
2202

6621TT 6898260

FIG.24a

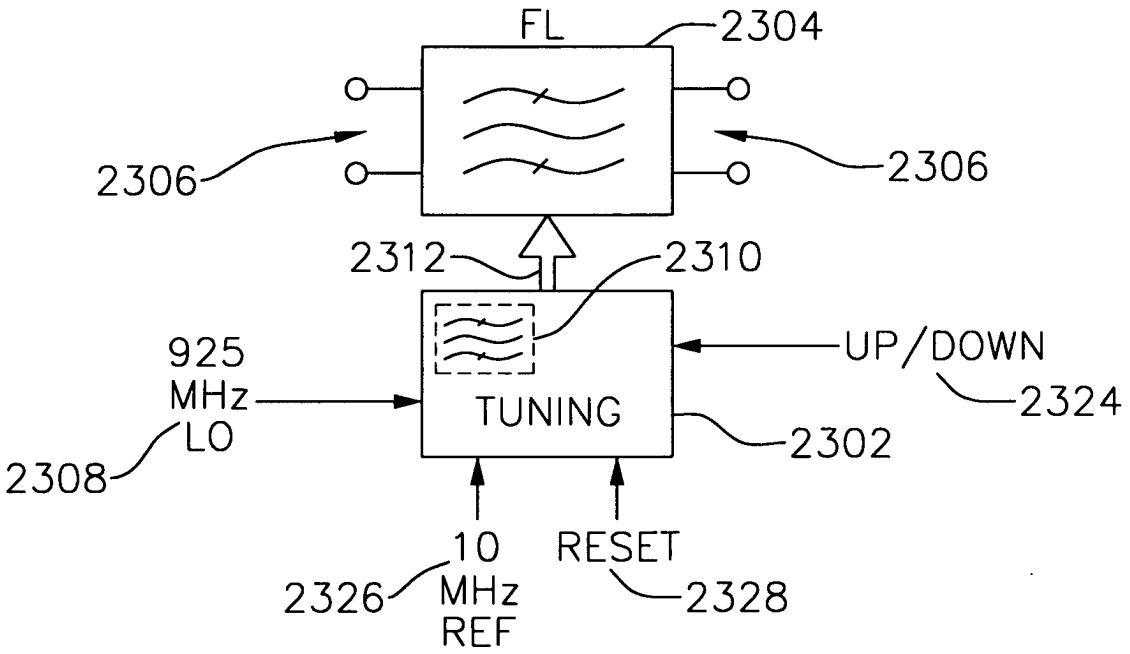
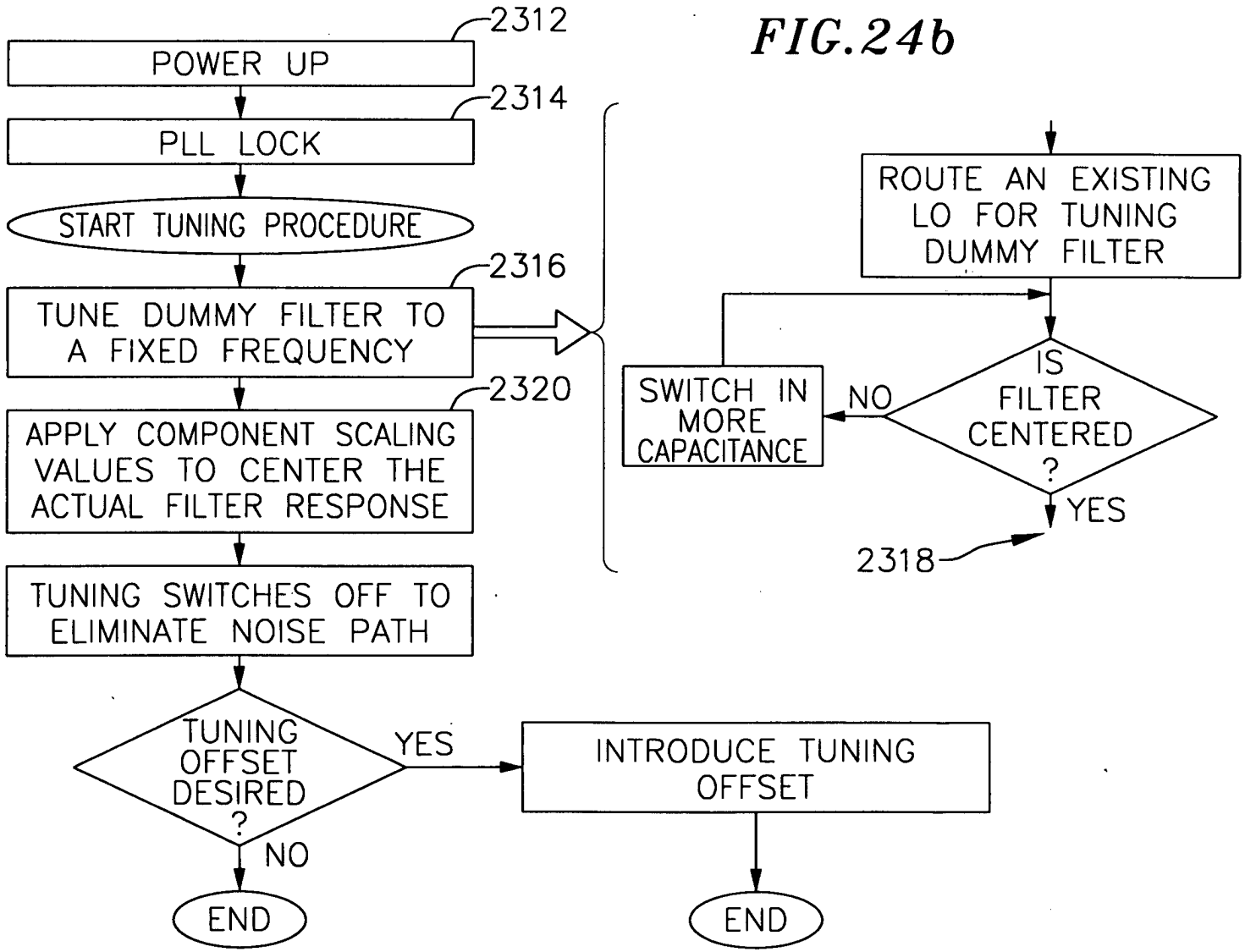
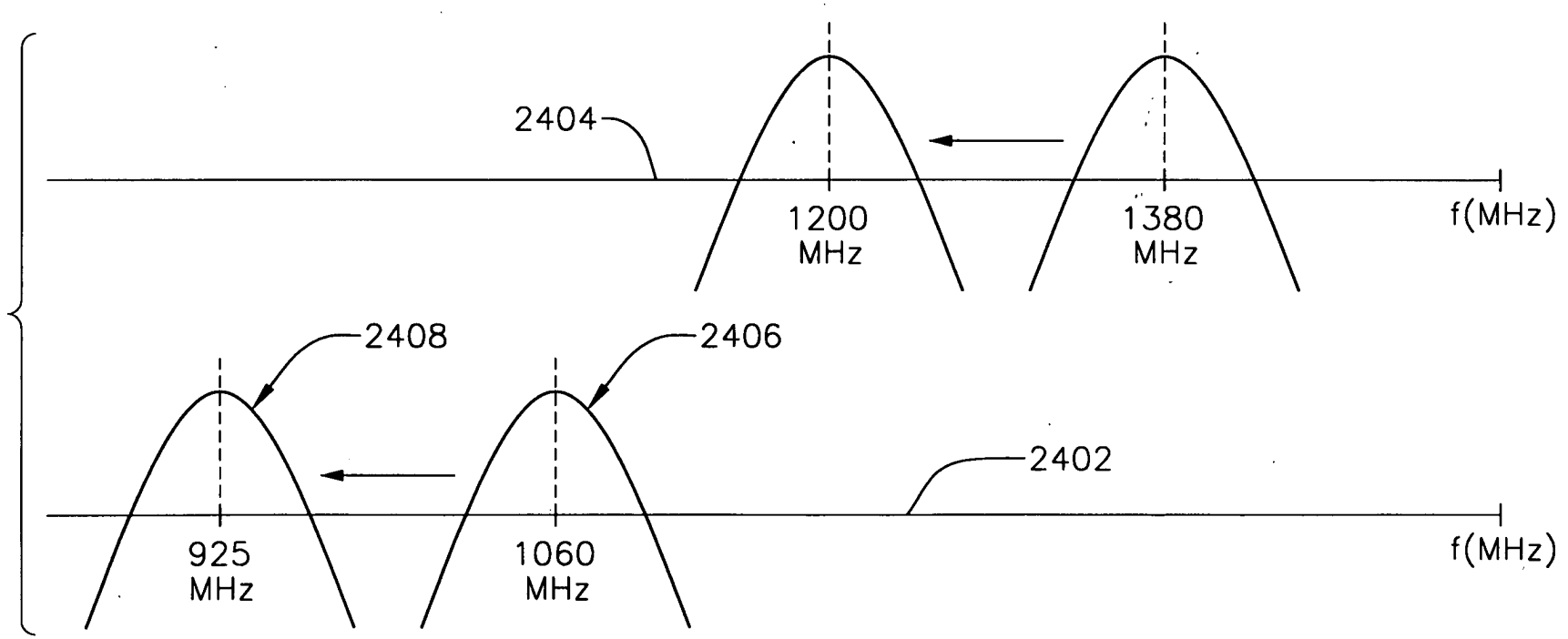


FIG.24b


2312
POWER UP
2314
PLL LOCK
START TUNING PROCEDURE
2316
TUNE DUMMY FILTER TO A FIXED FREQUENCY
2320
APPLY COMPONENT SCALING VALUES TO CENTER THE ACTUAL FILTER RESPONSE
TUNING SWITCHES OFF TO ELIMINATE NOISE PATH
TUNING OFFSET DESIRED ?
YES
NO
END
INTRODUCE TUNING OFFSET
END
ROUTE AN EXISTING LO FOR TUNING DUMMY FILTER
IS FILTER CENTERED ?
NO
SWITCH IN MORE CAPACITANCE
YES
2318

6627TF 6898En60

FIG.24c



6627776 0398760

FIG.25

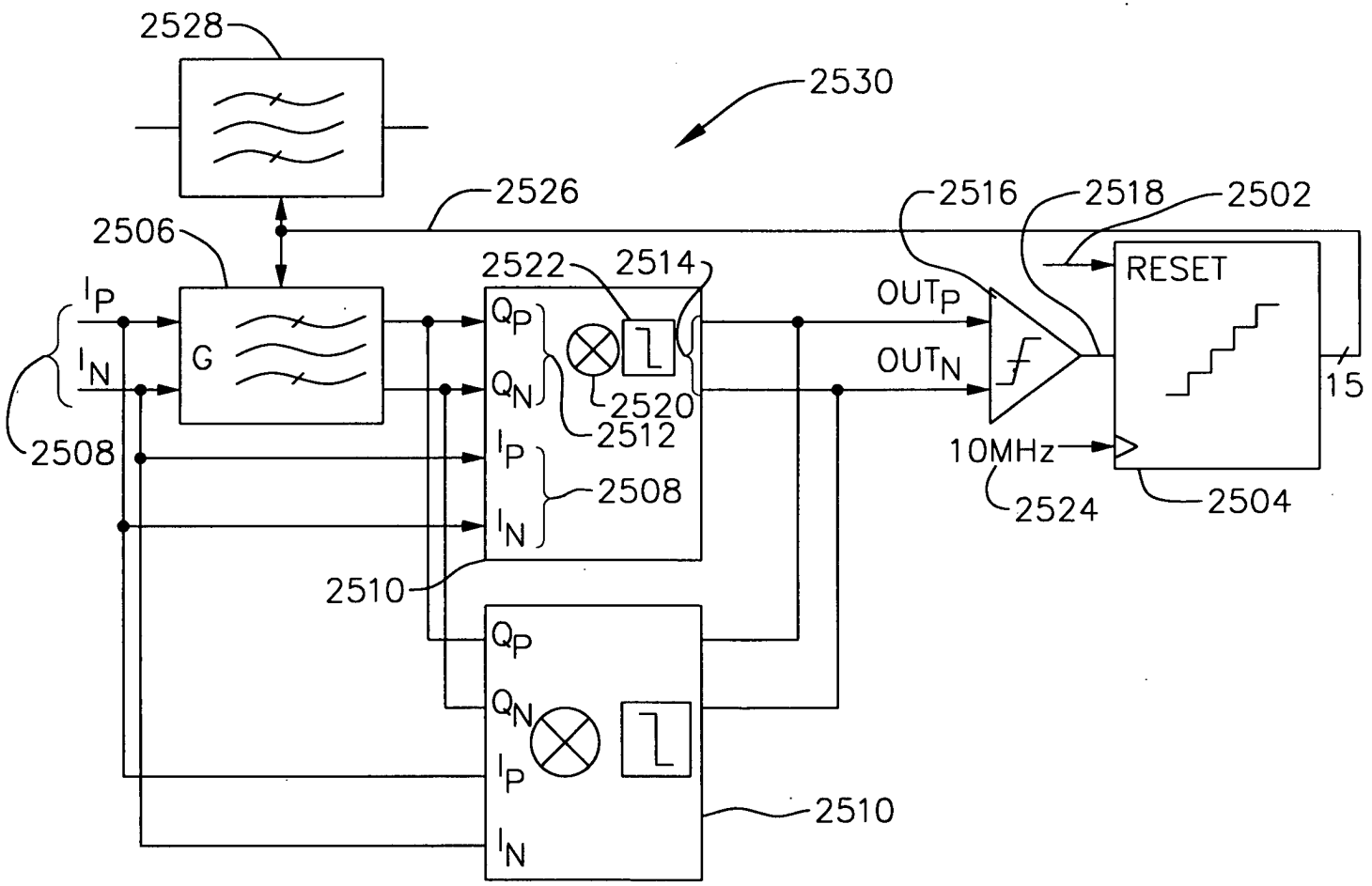
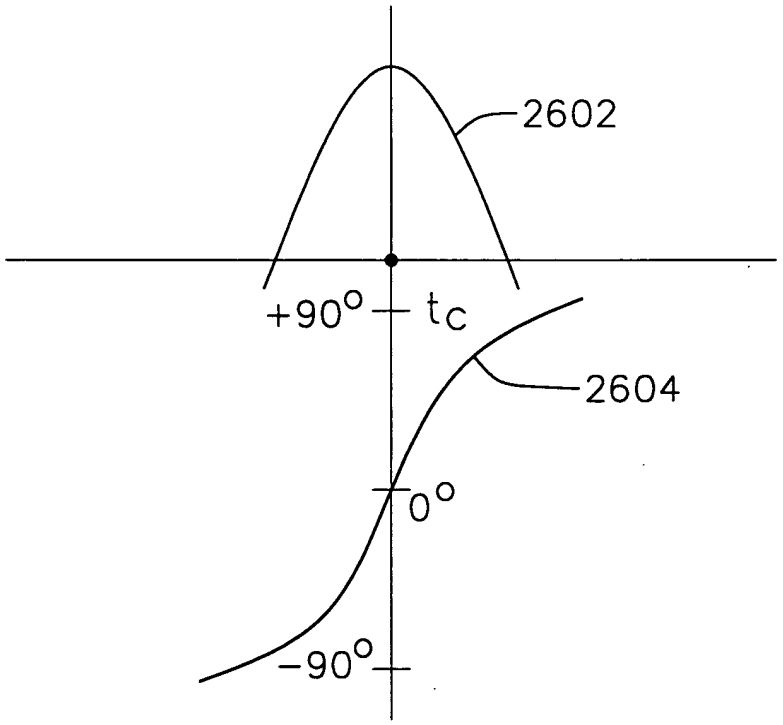


FIG.26



6627FF 6898260

FIG.27

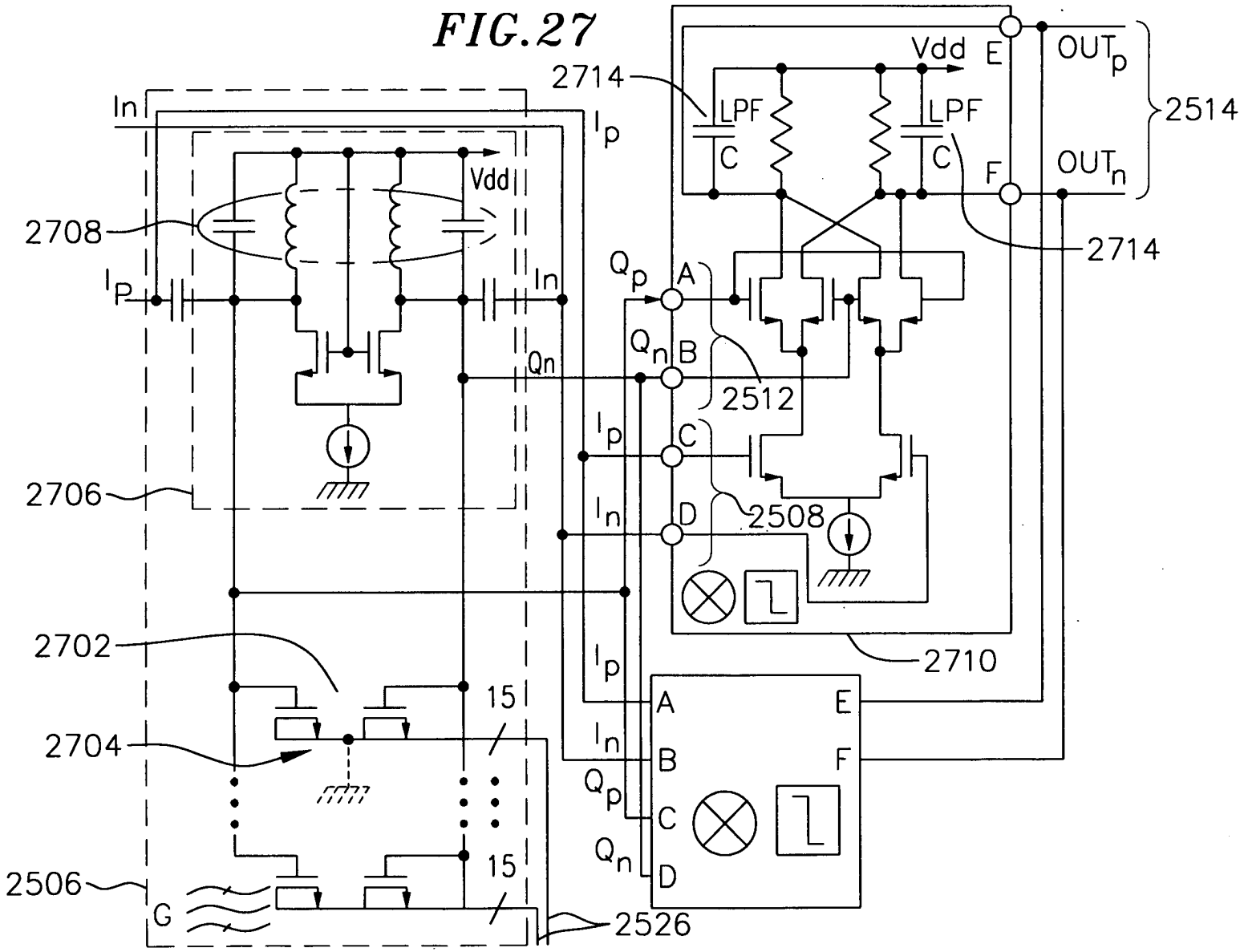


FIG.28

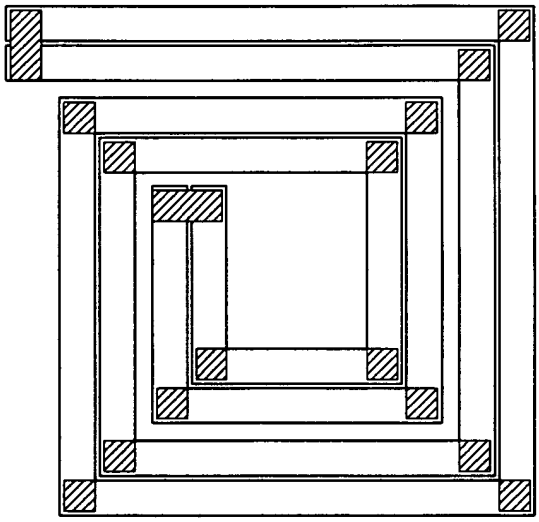


FIG. 29

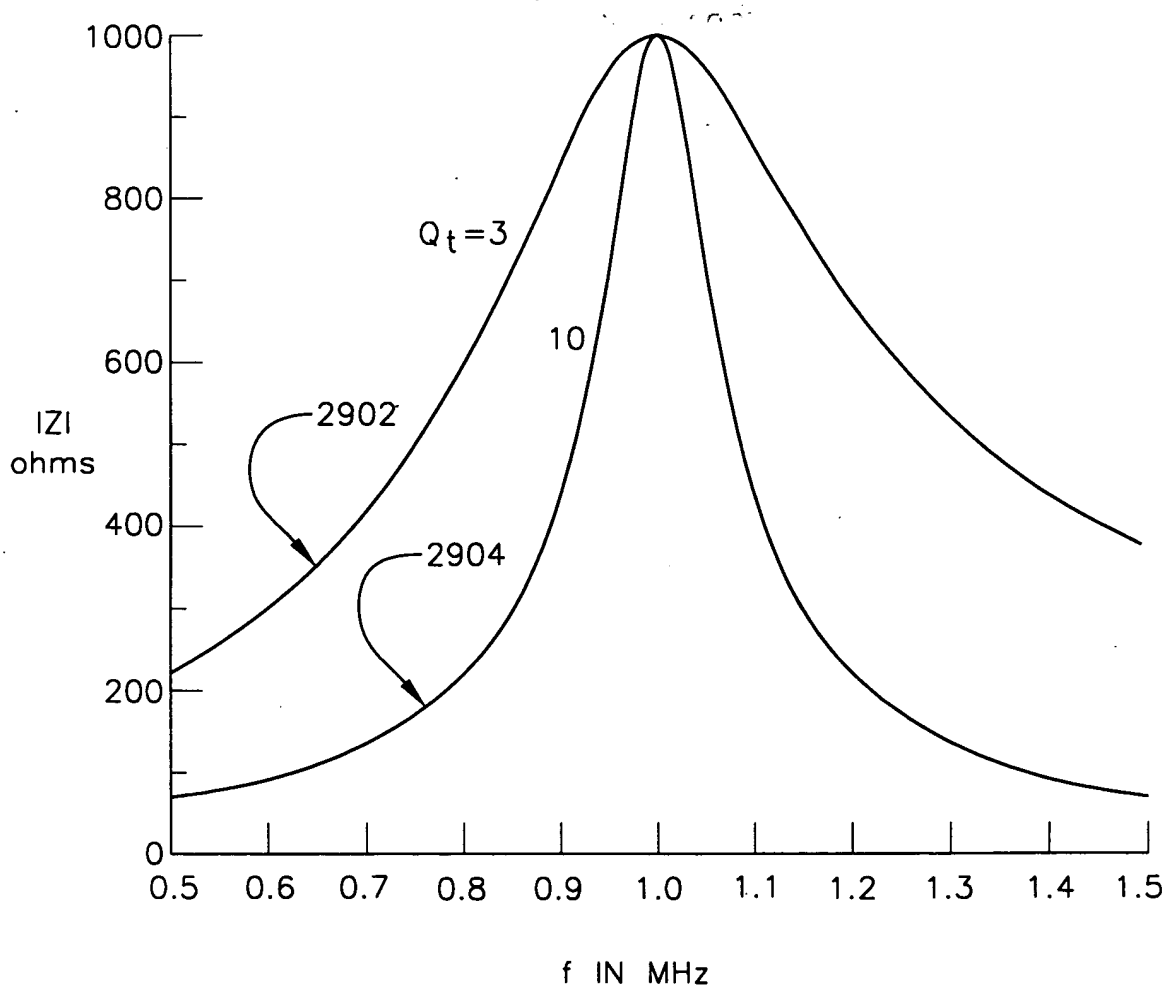

1000
800
600
400
200
0
IZI
ohms
Q_t=3
10
2902
2904
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
1.3
1.4
1.5
f IN MHz

FIG.30

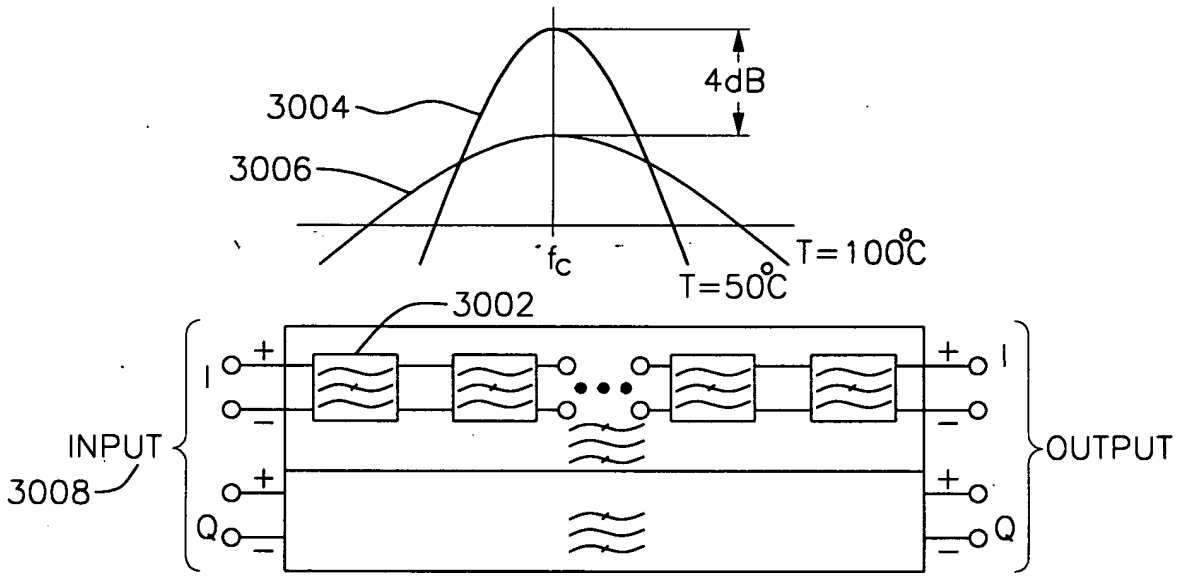

4dB
3004
3006
f_c
T=100°C
T=50°C
3002
INPUT
3008
I
Q
OUTPUT

FIG.31

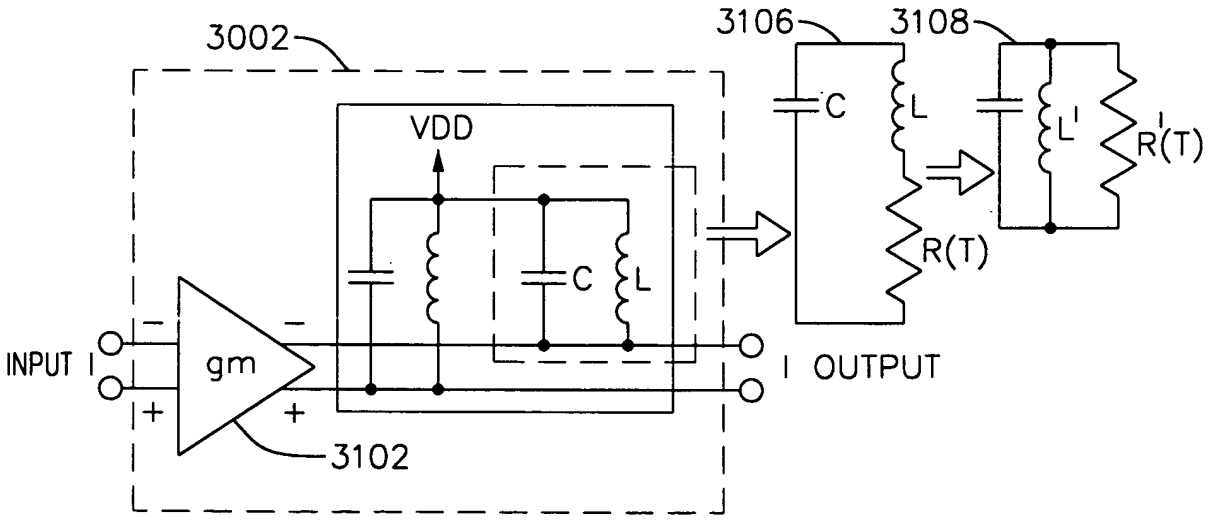
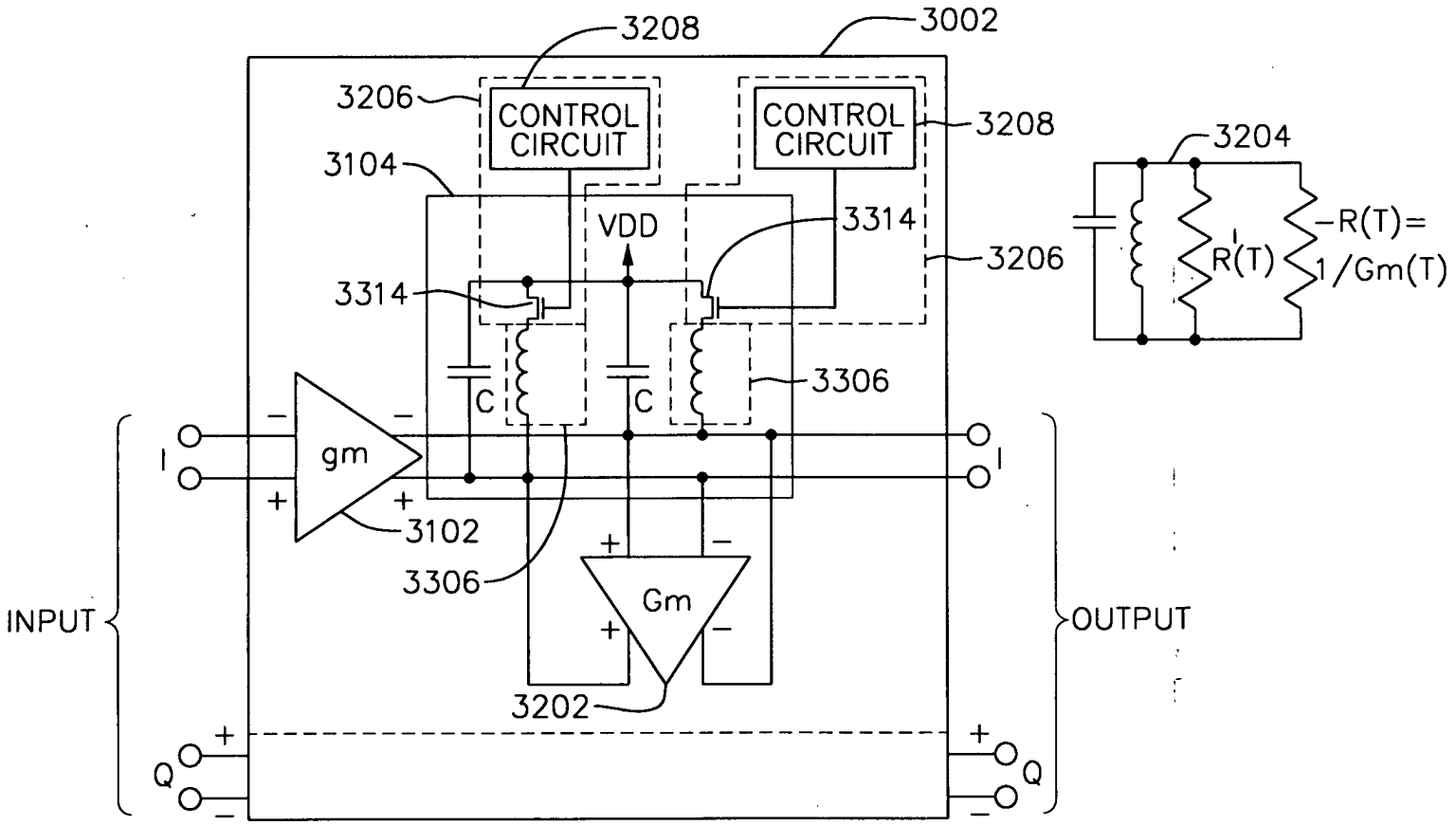

3002
3106
3108
VDD
C
L
R(T)
INPUT I
gm
3102
I OUTPUT

FIG.32


3208
3002
3206
CONTROL CIRCUIT
CONTROL CIRCUIT
3208
3104
VDD
3314
3314
3206
3204
R(T)=
1/Gm(T)
R(T)
C
C
3306
gm
3102
3306
Gm
3202
INPUT
OUTPUT
I
I
Q
Q
+
−

6627TT 6898260

FIG.33

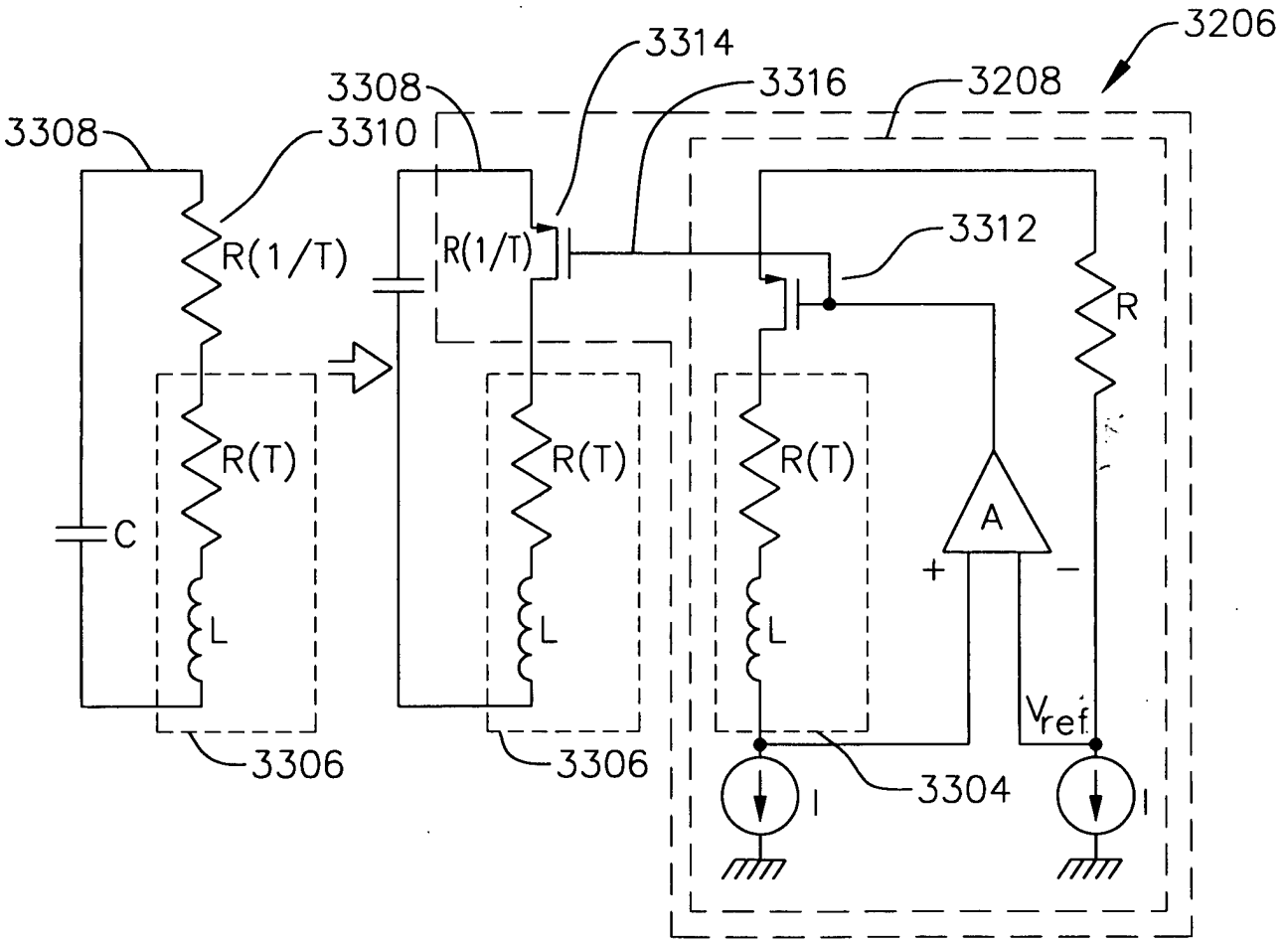


FIG.34

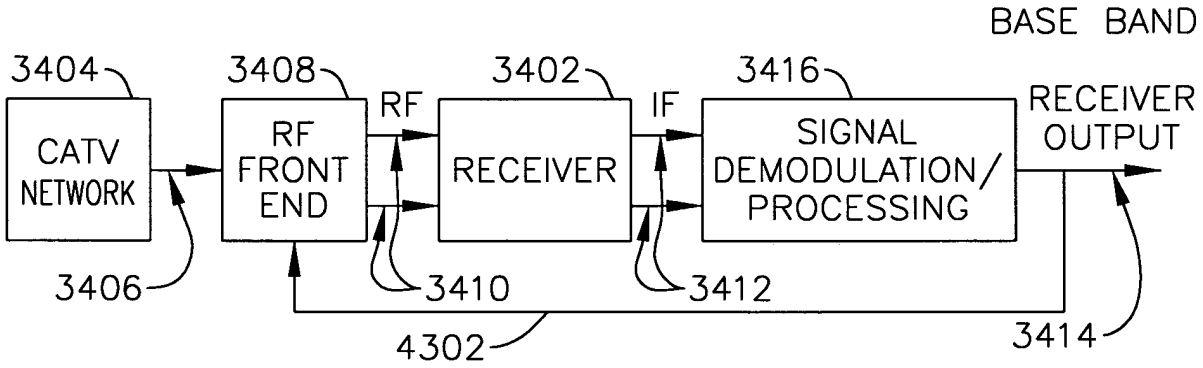

BASE BAND
3404
CATV NETWORK
3406
3408
RF FRONT END
RF
3402
RECEIVER
IF
3416
SIGNAL DEMODULATION/ PROCESSING
RECEIVER OUTPUT
3410
3412
4302
3414

FIG.35

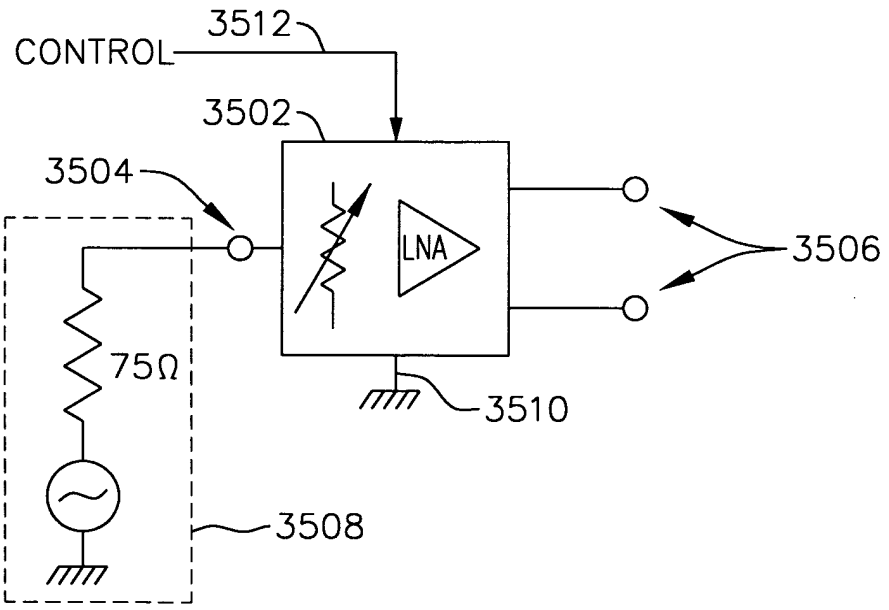

CONTROL
3512
3502
3504
LNA
3506
75Ω
3510
3508

FIG.36

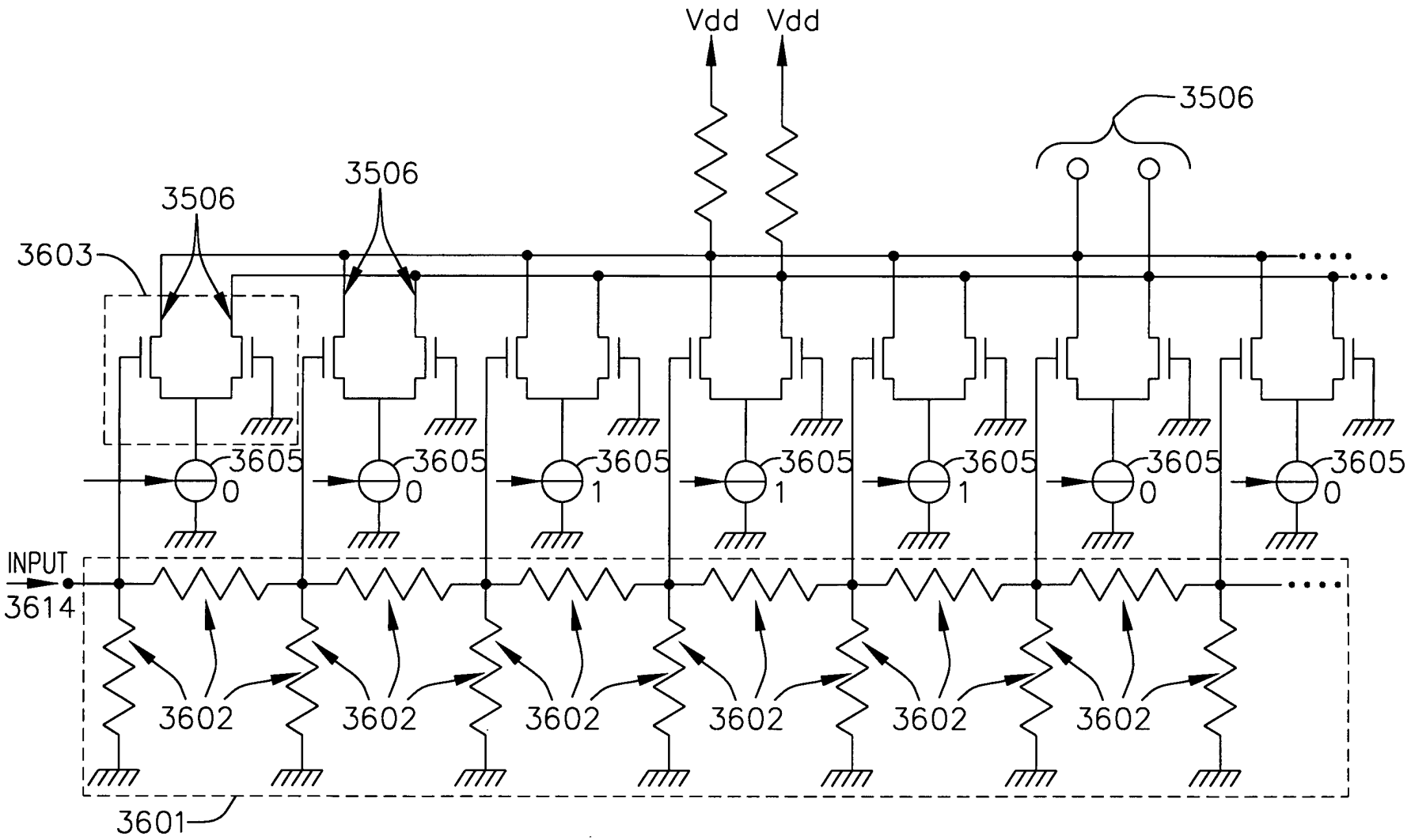

Vdd
Vdd
3506
3506
3506
3603
3605
0
3605
0
3605
1
3605
1
3605
1
3605
0
3605
0
INPUT
3614
3602
3602
3602
3602
3602
3602
3601

FIG.37

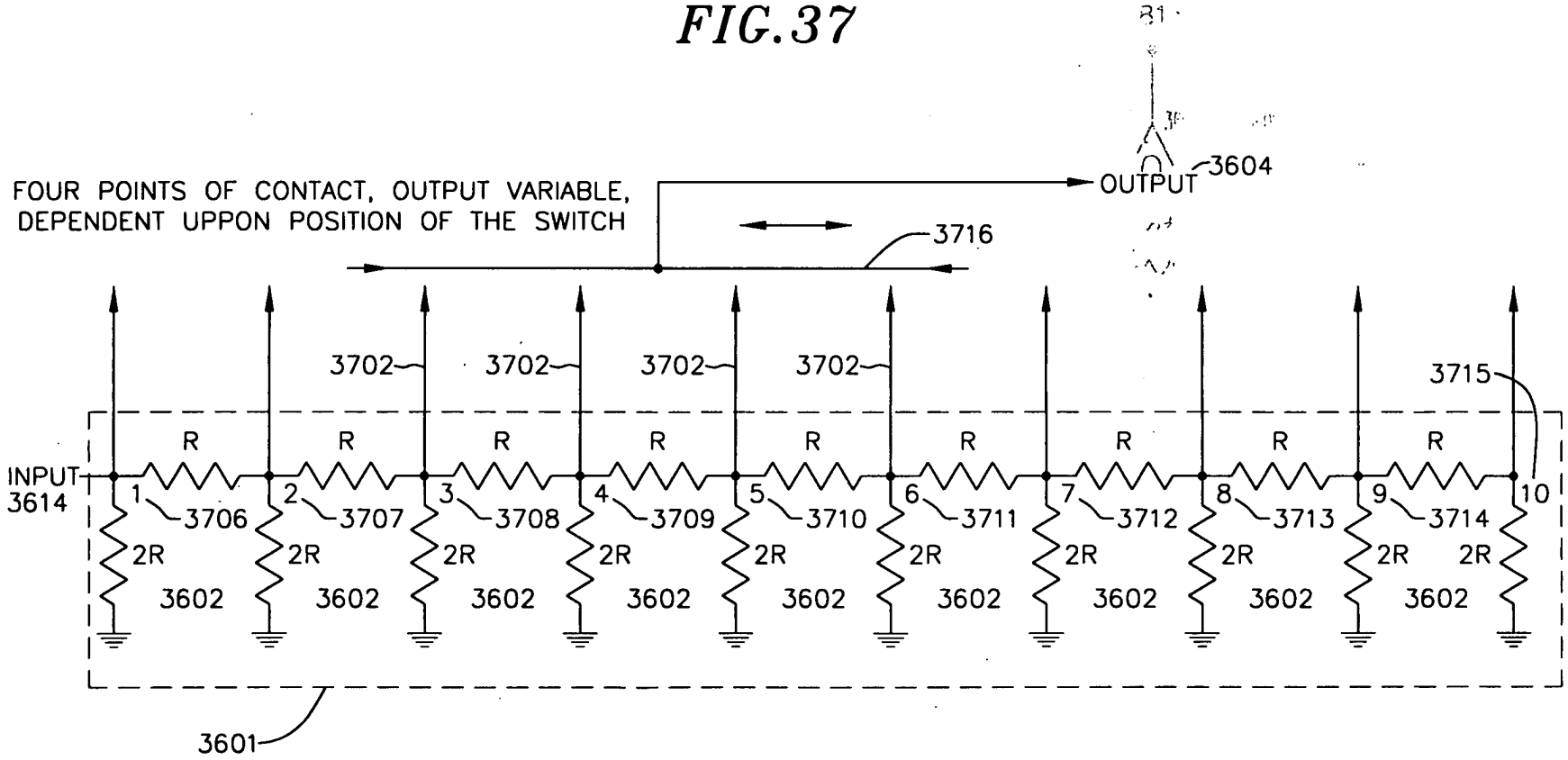

FOUR POINTS OF CONTACT, OUTPUT VARIABLE, DEPENDENT UPPON POSITION OF THE SWITCH
OUTPUT
3604
3716
3702
3715
R
INPUT
3614
1
3706
2
3707
3708
4
3709
5
3710
6
3711
7
3712
8
3713
9
3714
10
2R
3602
3601

FIG.38

PGA SETTINGS

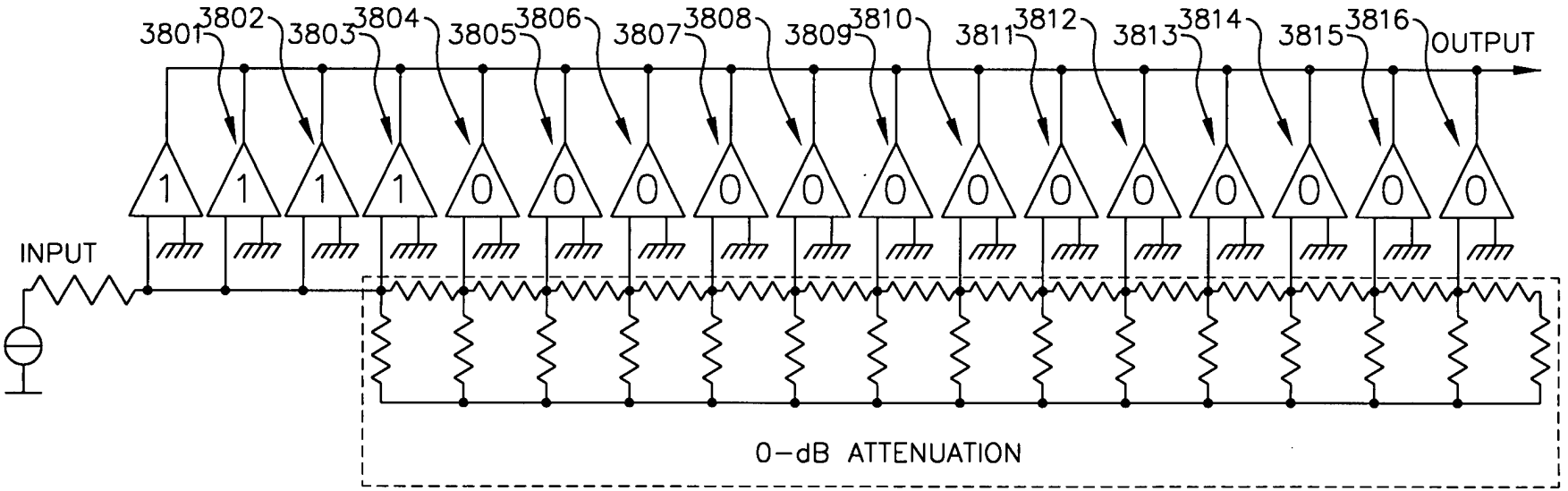


FIG.39

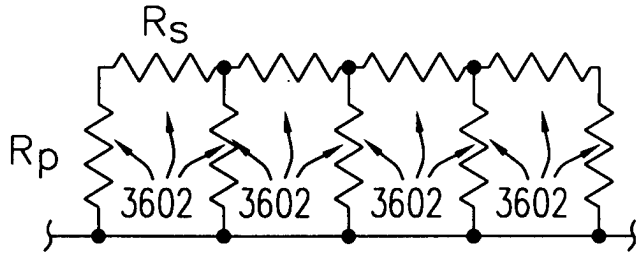

Rs
Rp
3602
3602
3602
3602

FIG.40

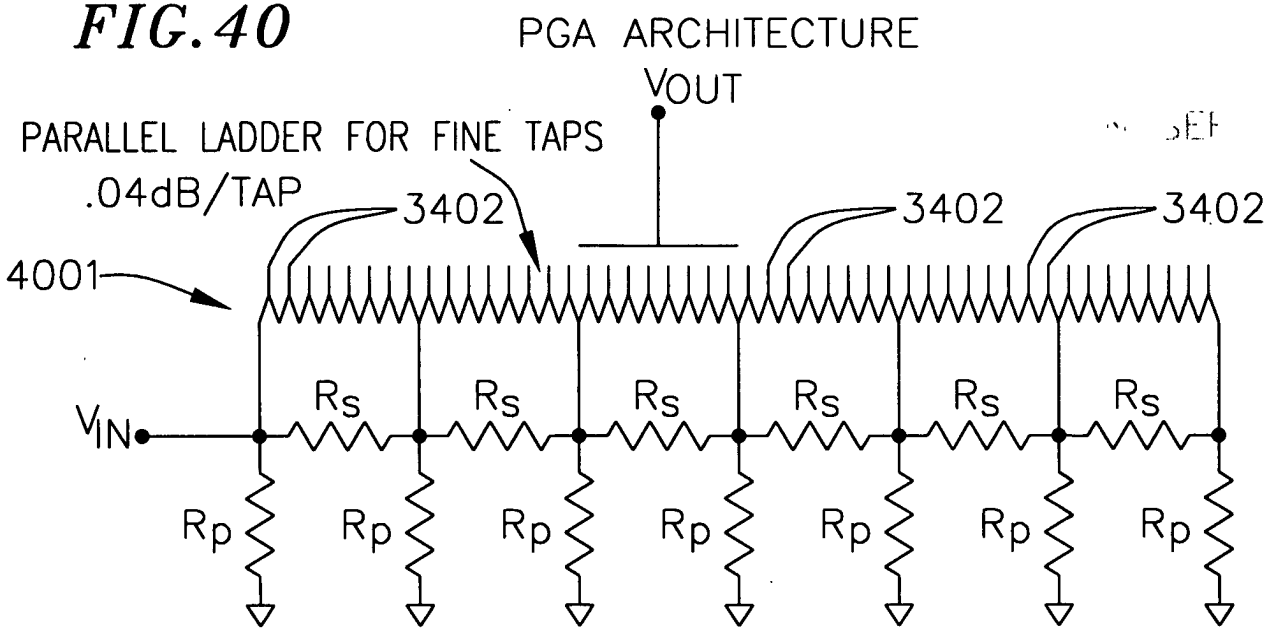
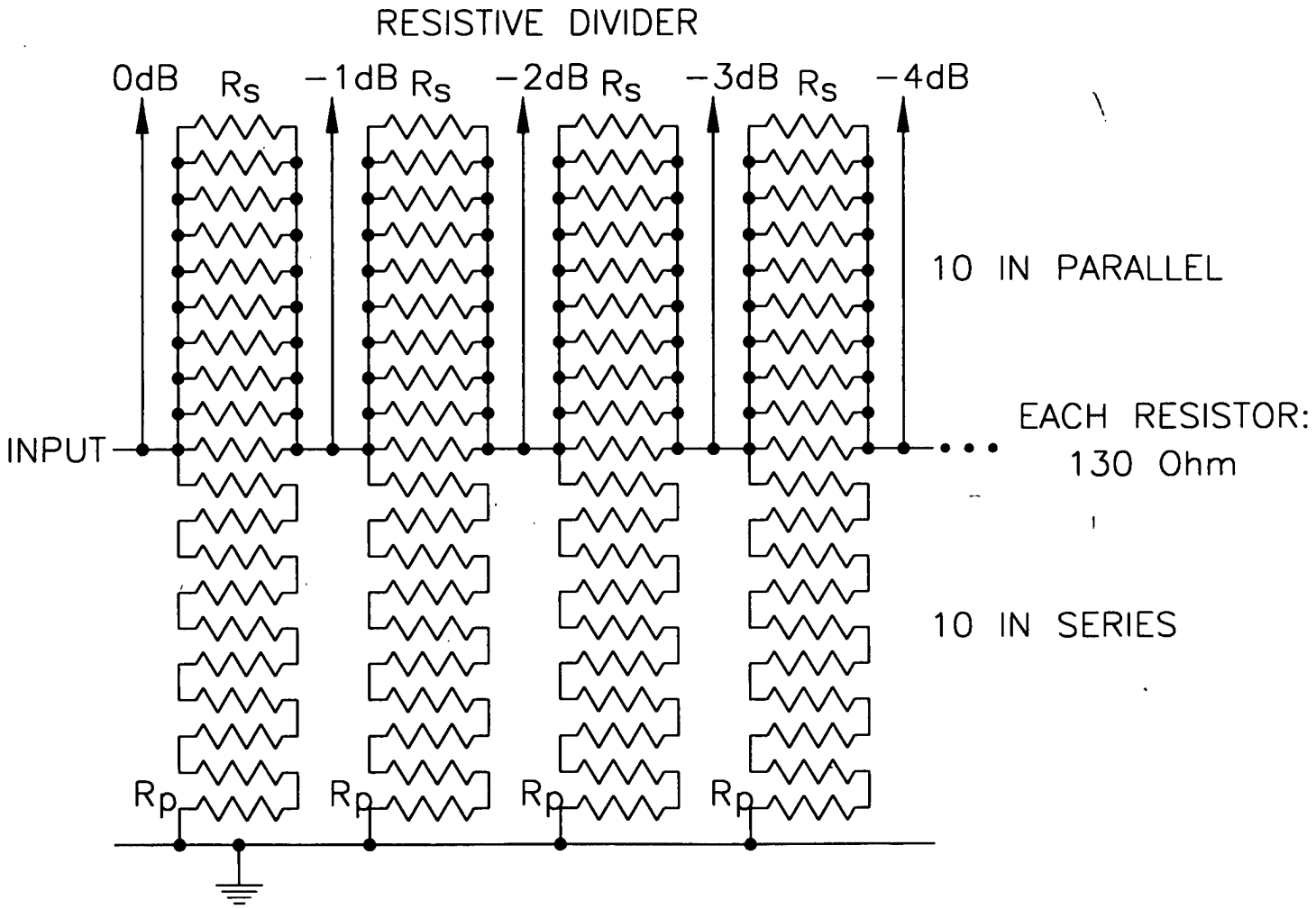

PGA ARCHITECTURE
VOUT
PARALLEL LADDER FOR FINE TAPS
.04dB/TAP
3402
3402
3402
4001
VIN
Rs
Rs
Rs
Rs
Rs
Rs
Rp
Rp
Rp
Rp
Rp
Rp
Rp

FIG. 41


RESISTIVE DIVIDER
0dB
Rs
−1dB
Rs
−2dB
Rs
−3dB
Rs
−4dB
10 IN PARALLEL
INPUT
EACH RESISTOR:
130 Ohm
10 IN SERIES
Rp
Rp
Rp
Rp

6621TT" 6898760

FIG. 42

NON–MONOTONICITY

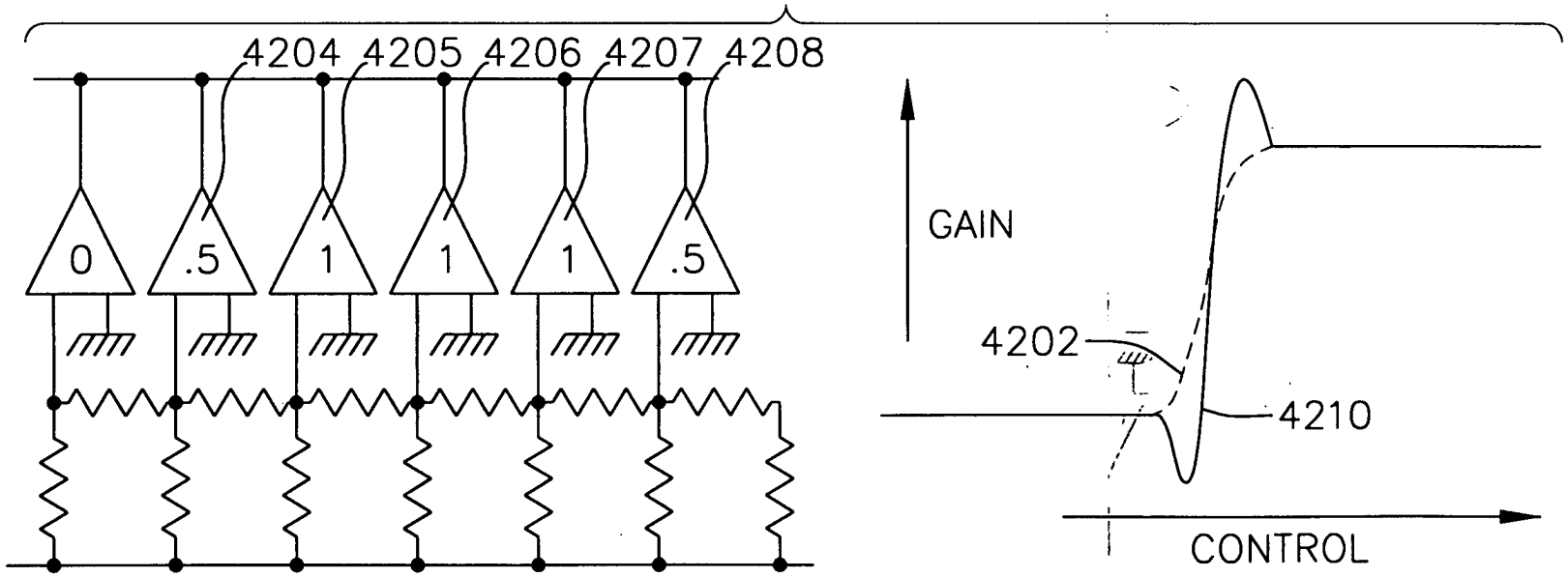


FIG. 43

CLAMPING CONTROL RANGE

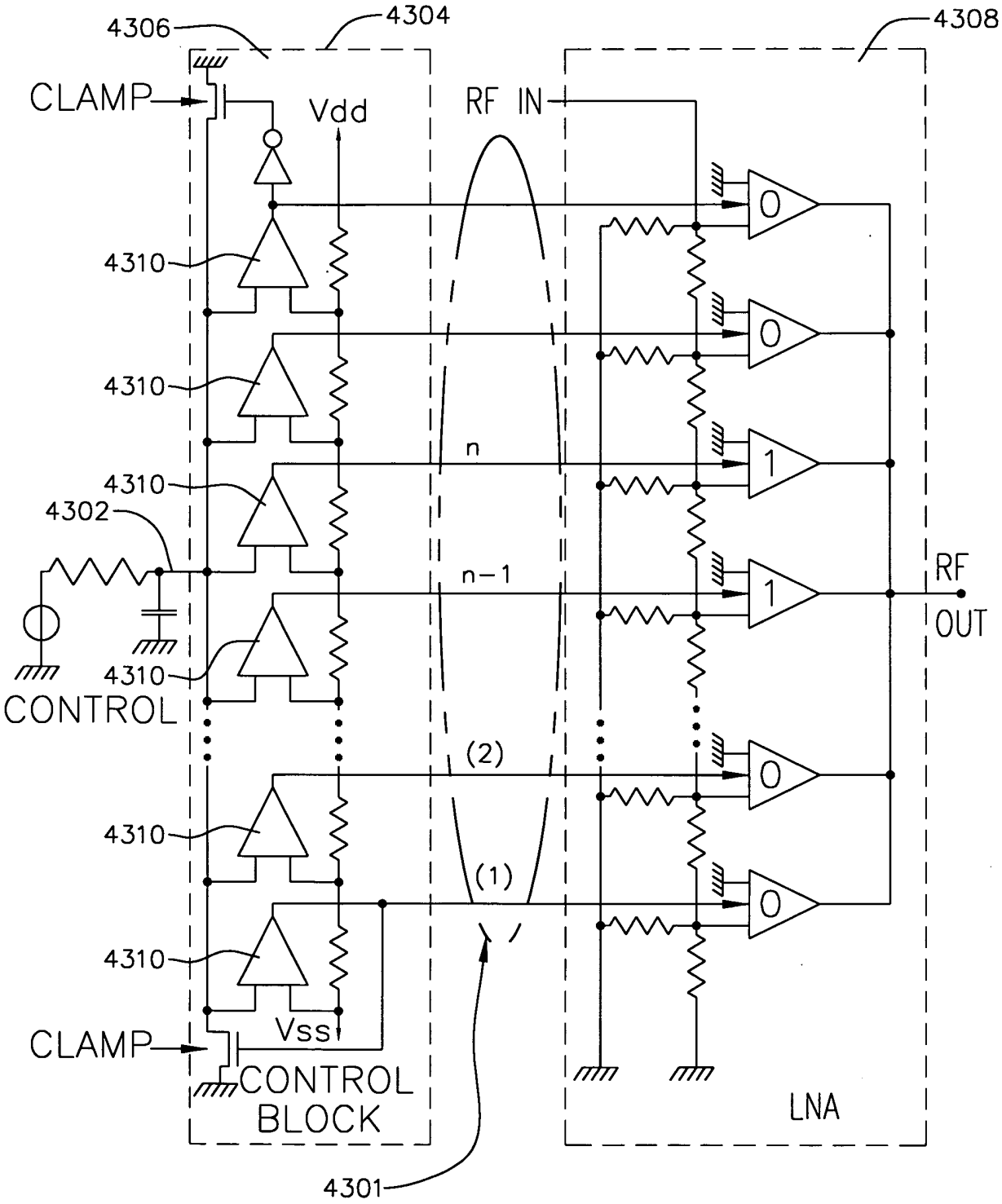


FIG.44α

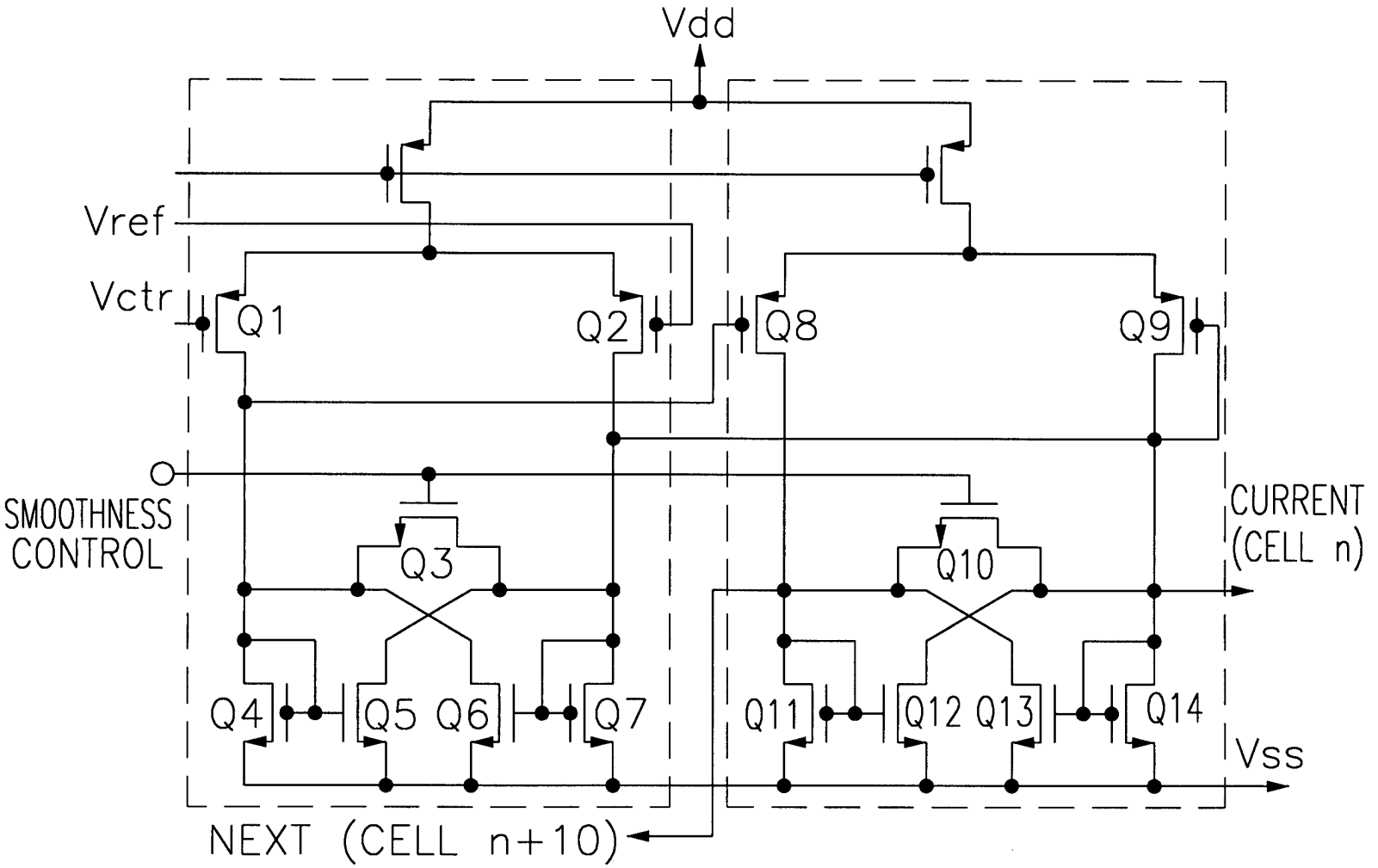

CONTROLLED GAIN COMPARATOR
Vdd
Vref
Vctr
Q1
Q2
Q8
Q9
SMOOTHNESS CONTROL
Q3
Q10
CURRENT (CELL n)
Q4
Q5 Q6
Q7
Q11
Q12 Q13
Q14
Vss
NEXT (CELL n+10)

FIG.44b

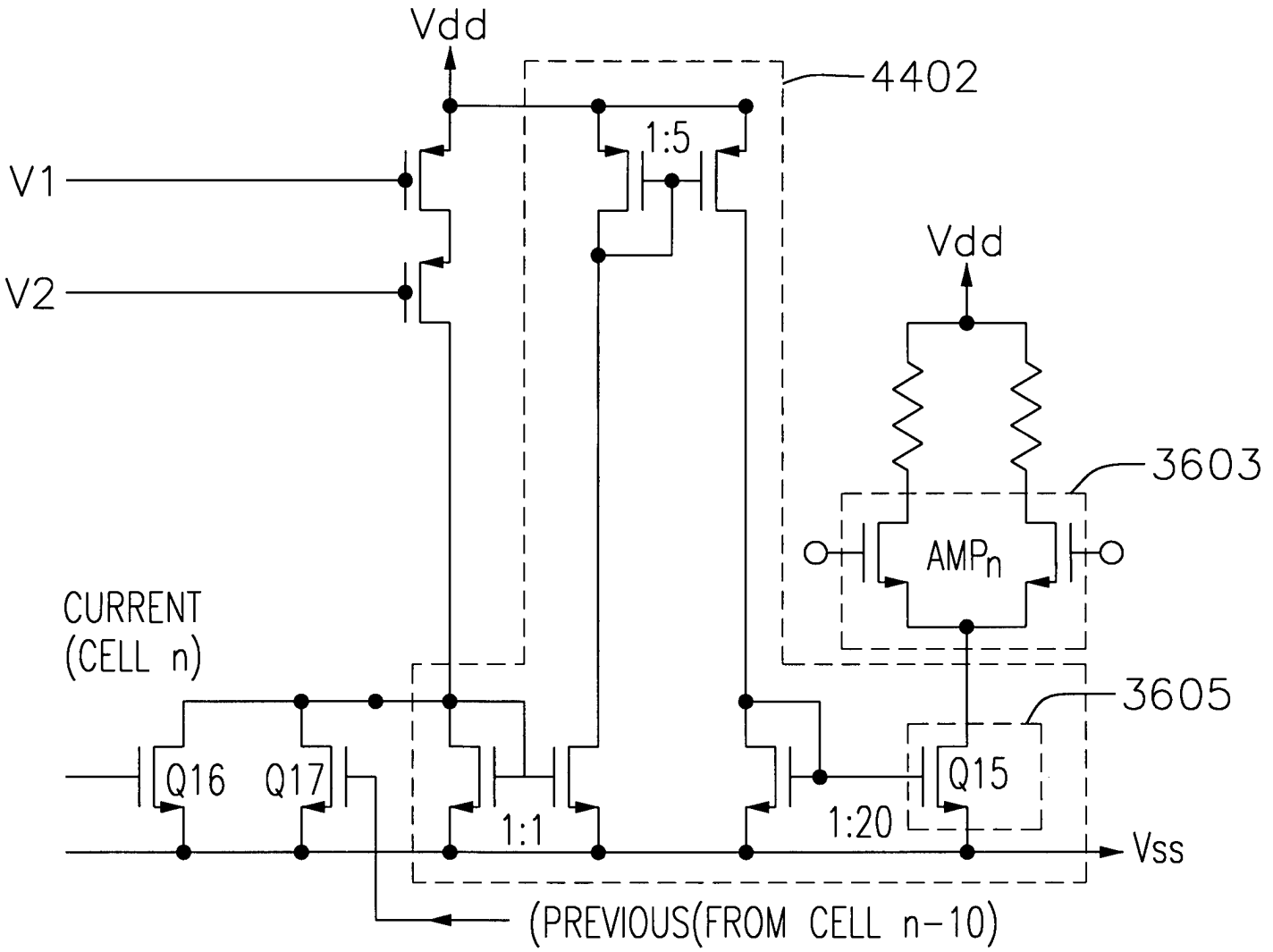

Vdd
4402
1:5
V1
V2
Vdd
3603
AMPn
CURRENT
(CELL n)
3605
Q16
Q17
1:1
Q15
1:20
Vss
(PREVIOUS(FROM CELL n-10)

FIG. 45

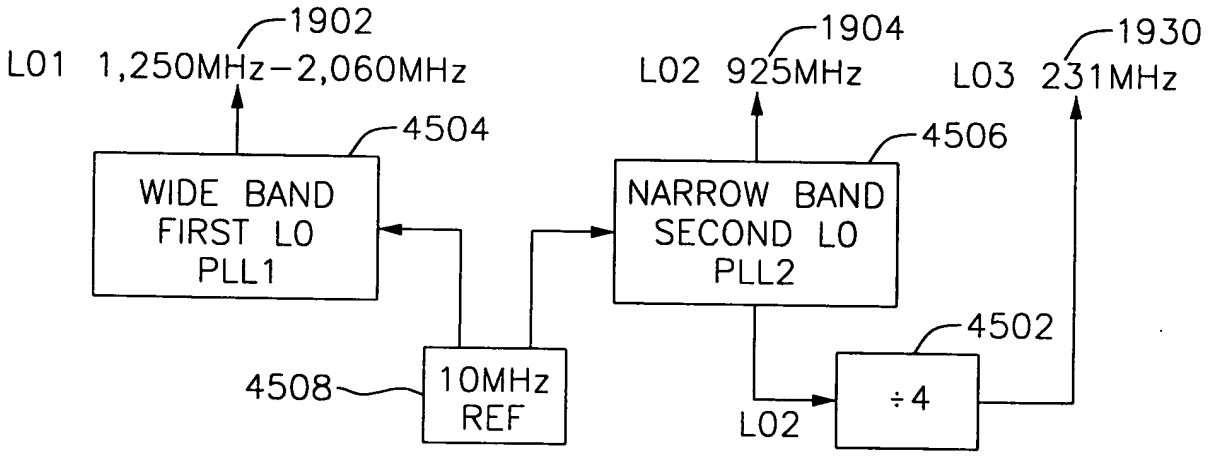

1902
L01 1,250MHz–2,060MHz
1904
L02 925MHz
1930
L03 231MHz
4504
WIDE BAND
FIRST LO
PLL1
4506
NARROW BAND
SECOND LO
PLL2
4502
÷4
L02
4508
10MHz
REF

FIG. 46

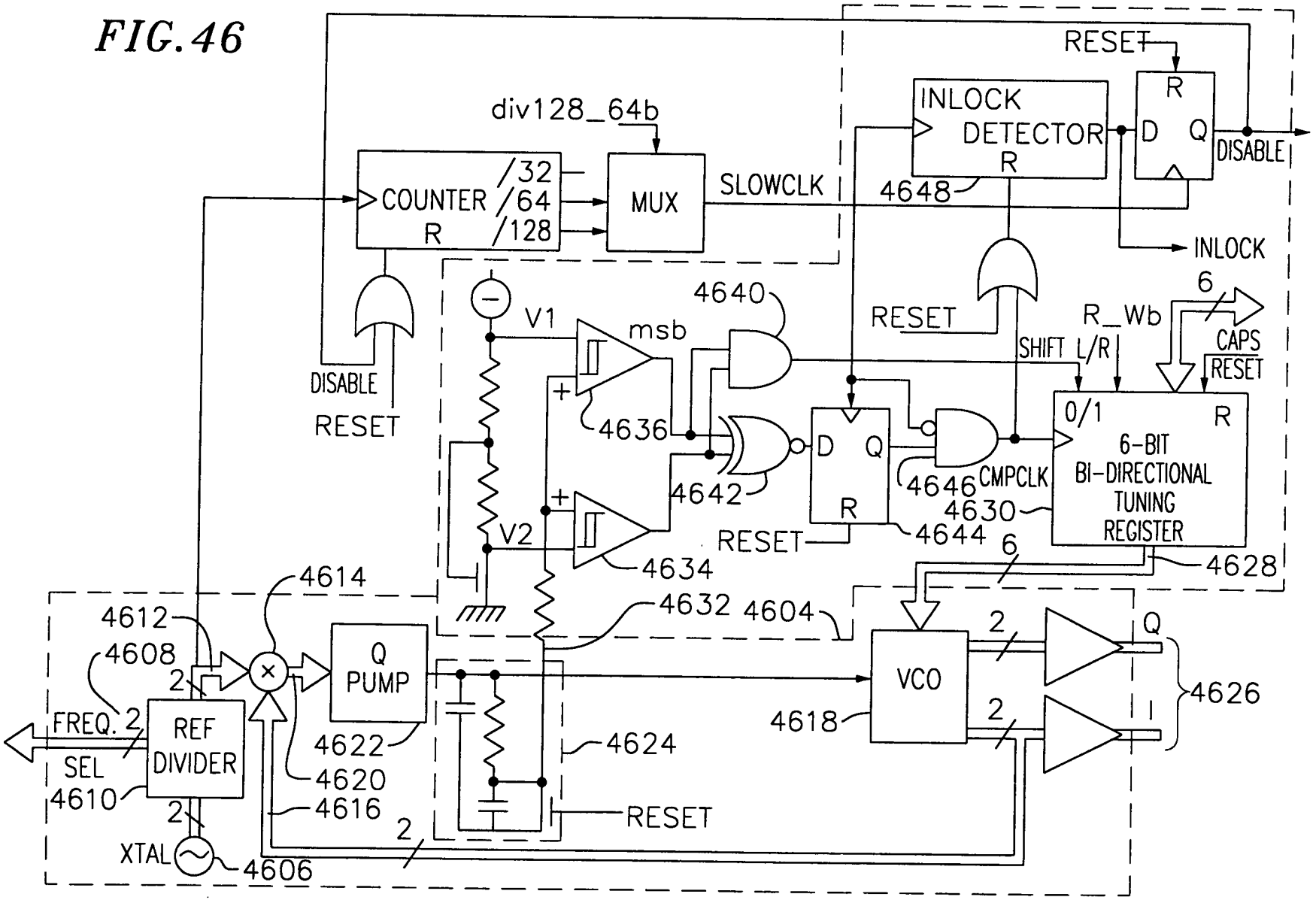

RESET
div128_64b
INLOCK DETECTOR
R
D Q
DISABLE
COUNTER
/32
/64
/128
R
MUX
SLOWCLK
4648
INLOCK
6
4640
V1
msb
RESET
R_Wb
SHIFT L/R
CAPS RESET
DISABLE
RESET
4636
4642
D Q
R
CMPCLK
4646
0/1
R
6-BIT BI-DIRECTIONAL TUNING REGISTER
4630
V2
4634
RESET
4644
6
4628
4614
4612
4632
4604
2
Q
4608
Q PUMP
VCO
2
4626
FREQ. 2
REF DIVIDER
4622
4618
4624
SEL
4610
4620
4616
RESET
2
2
XTAL
4606

FIG. 47

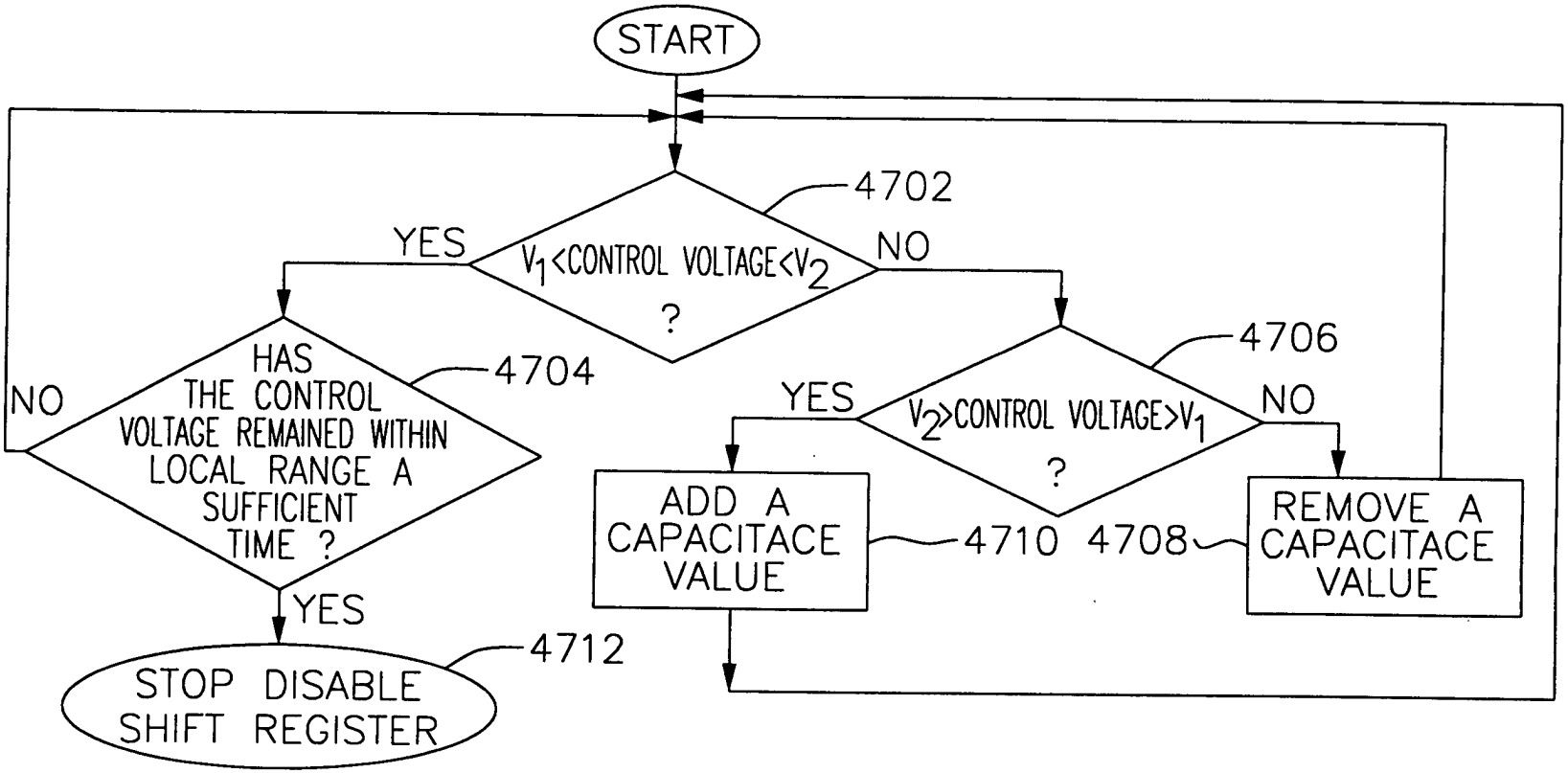

START
4702
YES
V_1<CONTROL VOLTAGE<V_2 ?
NO
HAS THE CONTROL VOLTAGE REMAINED WITHIN LOCAL RANGE A SUFFICIENT TIME ?
4704
NO
YES
STOP DISABLE SHIFT REGISTER
4712
4706
YES
V_2>CONTROL VOLTAGE>V_1 ?
NO
ADD A CAPACITACE VALUE
4710
REMOVE A CAPACITACE VALUE
4708

FIG. 48

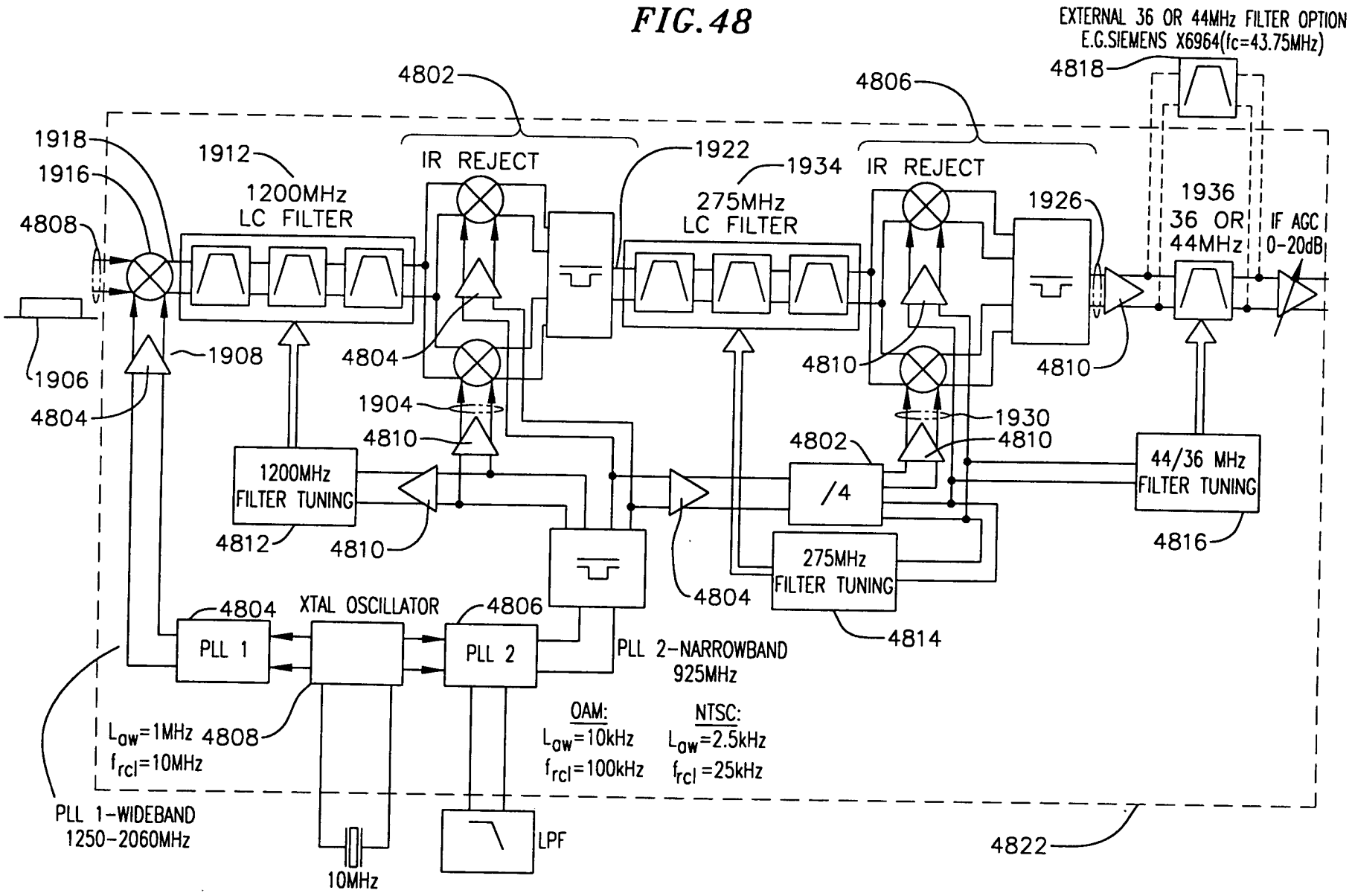

EXTERNAL 36 OR 44MHz FILTER OPTION
E.G.SIEMENS X6964(fc=43.75MHz)
4818
4802
4806
1918
1916
1912
1200MHz
LC FILTER
IR REJECT
1922
1934
275MHz
LC FILTER
IR REJECT
1926
1936
36 OR
44MHz
IF AGC
0-20dB
4808
1906
4804
1908
4804
4810
4810
1904
4810
1930
4810
1200MHz
FILTER TUNING
4812
4810
4802
/4
44/36 MHz
FILTER TUNING
4816
275MHz
FILTER TUNING
4814
4804
4804
XTAL OSCILLATOR
4806
PLL 1
PLL 2
PLL 2-NARROWBAND
925MHz
OAM:
L_{aw}=10kHz
f_{rcl}=100kHz
NTSC:
L_{aw}=2.5kHz
f_{rcl}=25kHz
L_{aw}=1MHz
f_{rcl}=10MHz
4808
PLL 1-WIDEBAND
1250-2060MHz
10MHz
LPF
4822

FIG. 49

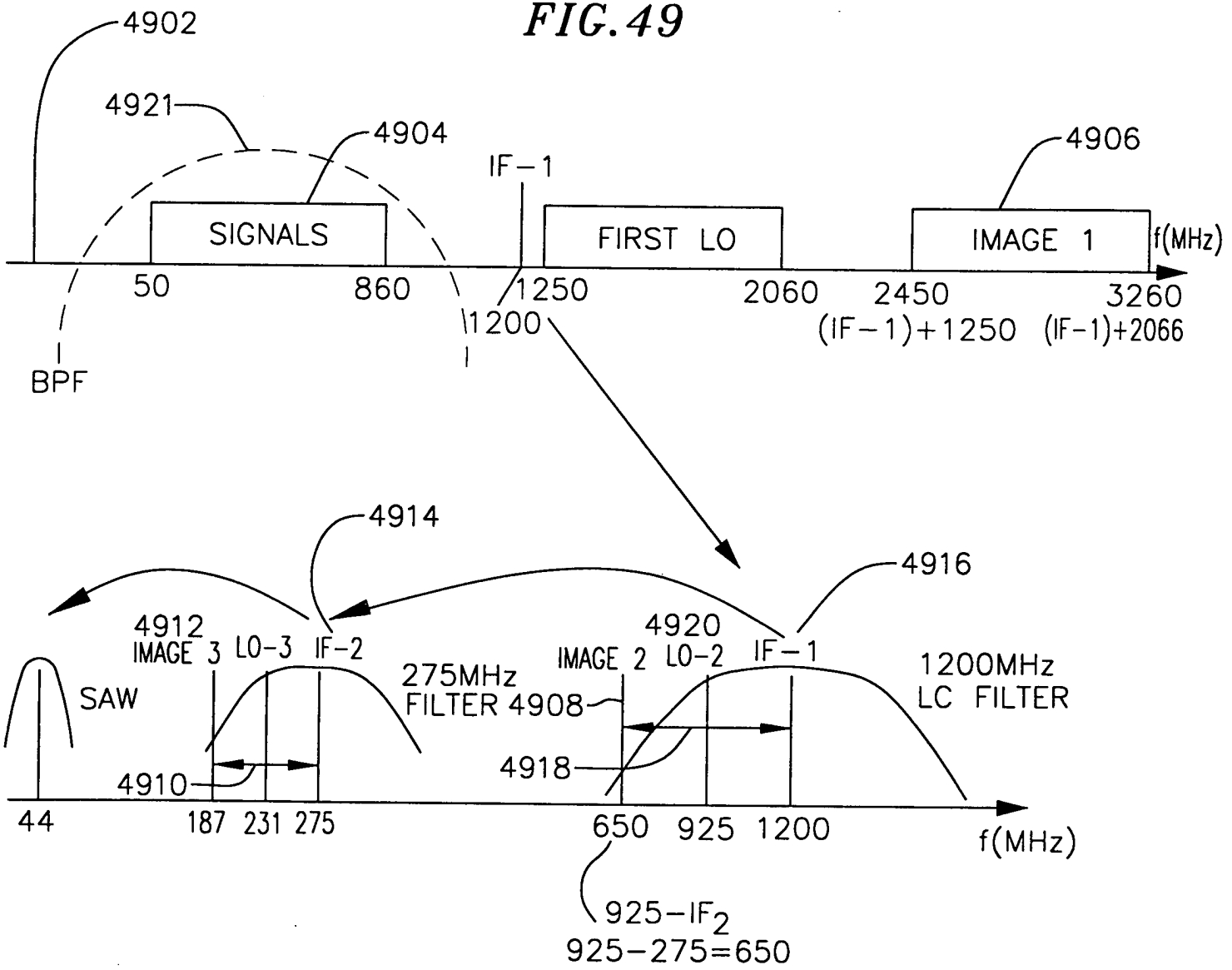

4902
4921
4904
IF-1
4906
SIGNALS
FIRST LO
IMAGE 1
f(MHz)
50
860
1250
2060
2450
3260
1200
(IF-1)+1250
(IF-1)+2066
BPF
4914
4916
4912
IMAGE 3
LO-3
IF-2
4920
IMAGE 2
LO-2
IF-1
SAW
275MHz
FILTER 4908
1200MHz
LC FILTER
4910
4918
44
187
231
275
650
925
1200
f(MHz)
925-IF2
925-275=650

FIG.50

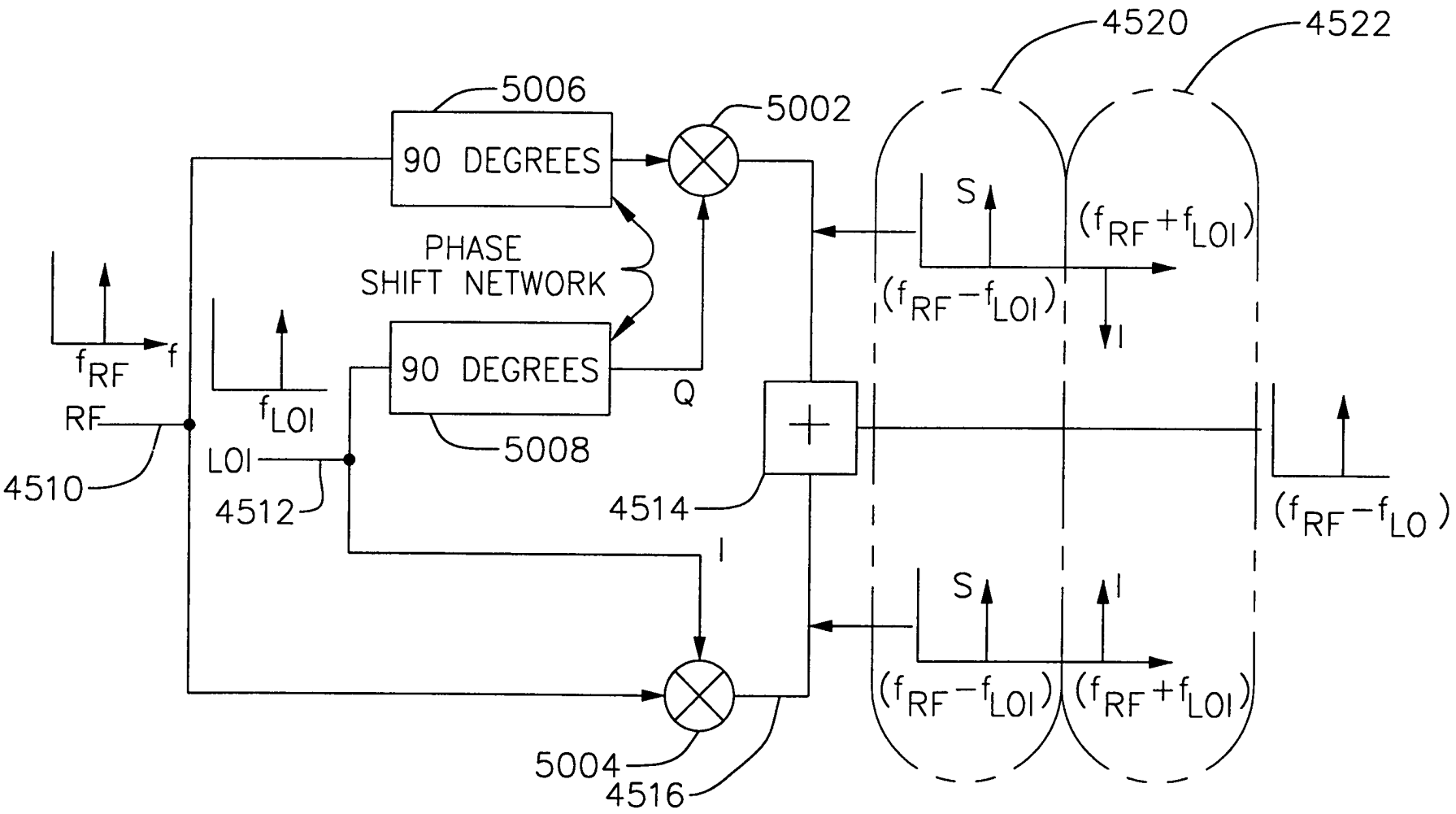

4520
4522
5006
5002
90 DEGREES
PHASE
SHIFT NETWORK
90 DEGREES
5008
Q
I
S
$(f_{RF}+f_{LOI})$
$(f_{RF}-f_{LOI})$
f_{RF}
f
RF
4510
f_{LOI}
LOI
4512
4514
$(f_{RF}-f_{LO})$
5004
4516

FIG.51

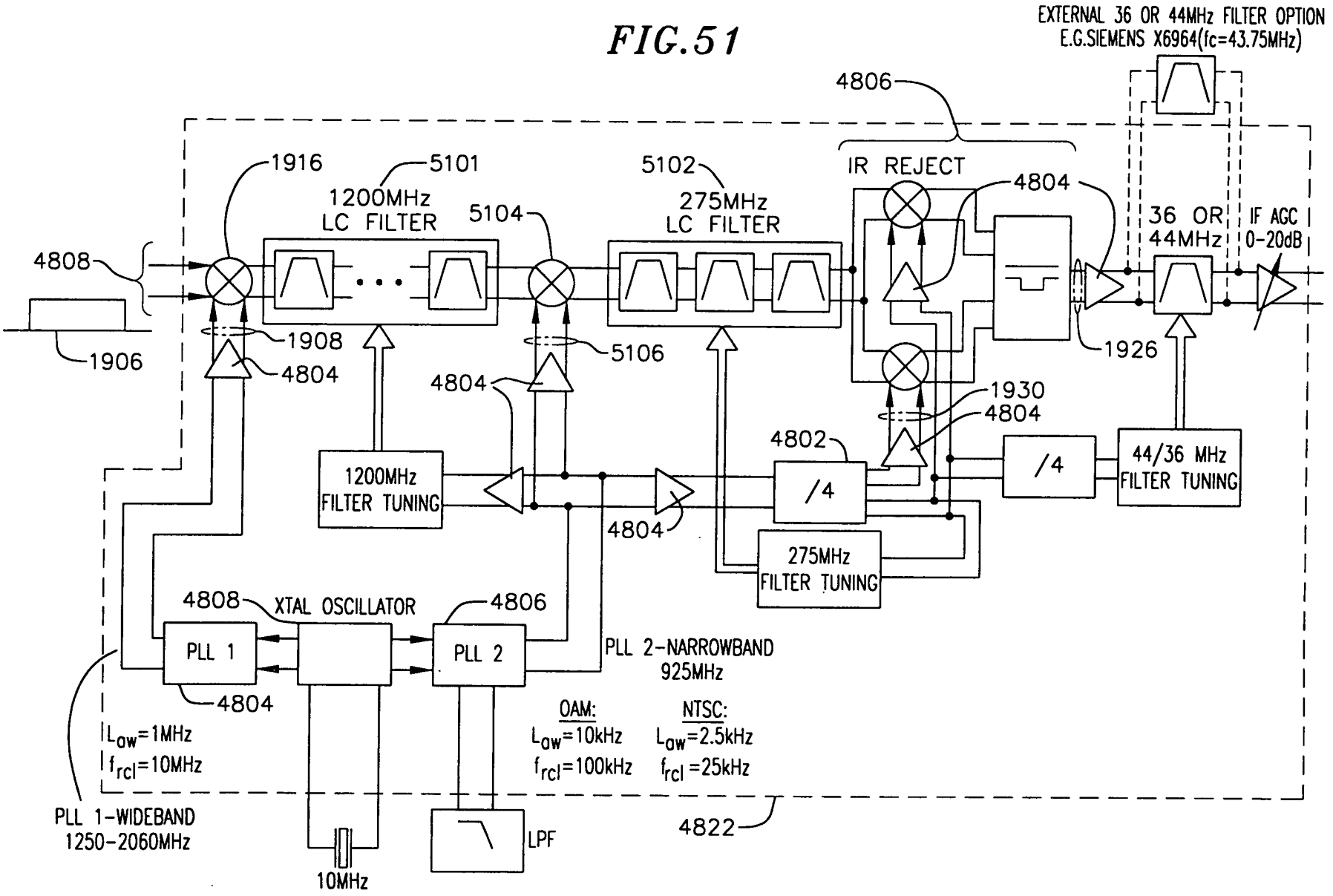

EXTERNAL 36 OR 44MHz FILTER OPTION
E.G.SIEMENS X6964(fc=43.75MHz)
4806
IR REJECT
1916
5101
1200MHz
LC FILTER
5104
5102
275MHz
LC FILTER
4804
36 OR
44MHz
IF AGC
0-20dB
4808
1906
1908
4804
5106
4804
1926
1930
4804
4802
/4
/4
44/36 MHz
FILTER TUNING
1200MHz
FILTER TUNING
4804
275MHz
FILTER TUNING
4808
XTAL OSCILLATOR
4806
PLL 1
PLL 2
PLL 2-NARROWBAND
925MHz
4804
OAM:
L_{aw}=10kHz
f_{rcl}=100kHz
NTSC:
L_{aw}=2.5kHz
f_{rcl}=25kHz
L_{aw}=1MHz
f_{rcl}=10MHz
PLL 1-WIDEBAND
1250-2060MHz
10MHz
LPF
4822

FIG.52

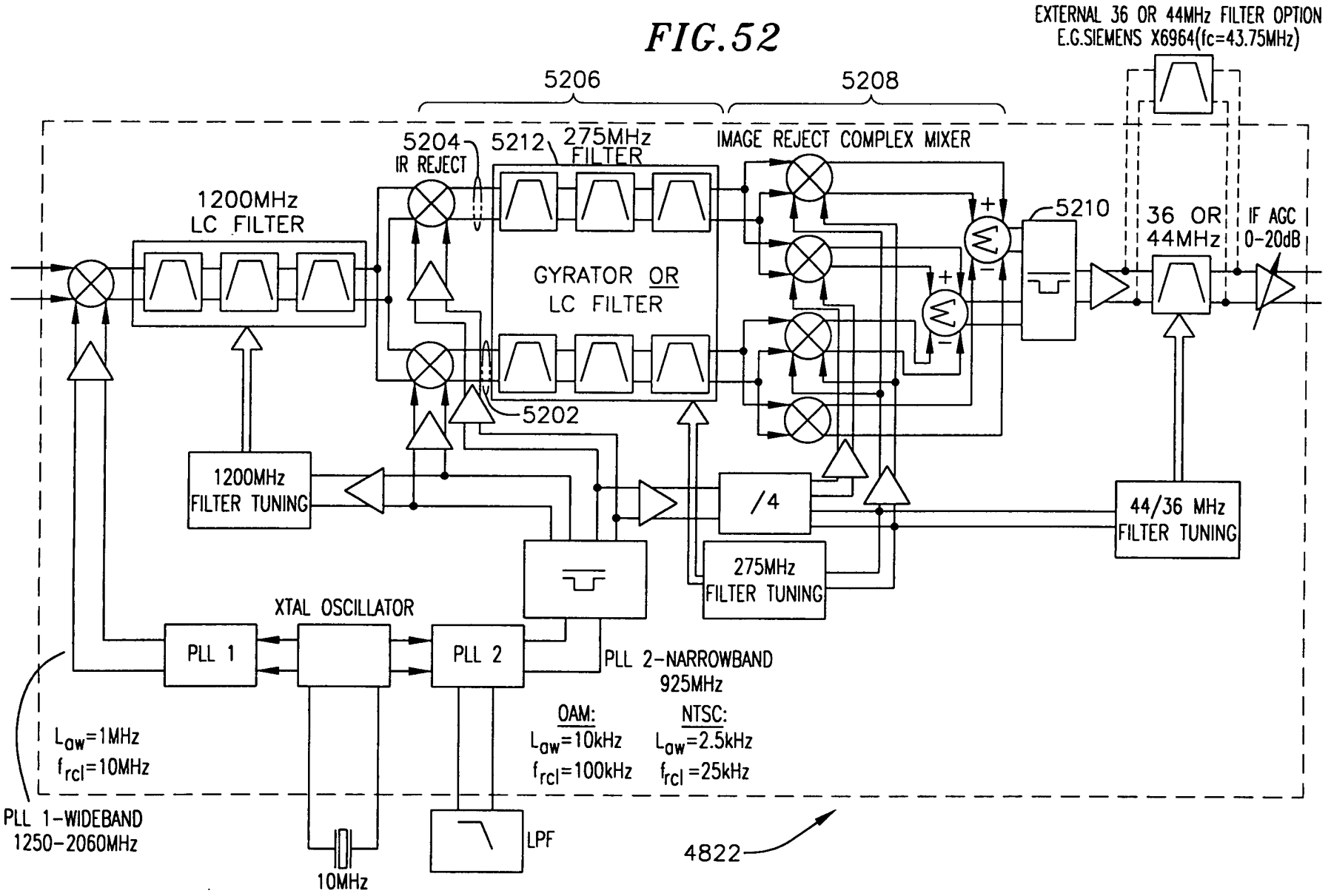

EXTERNAL 36 OR 44MHz FILTER OPTION
E.G.SIEMENS X6964(fc=43.75MHz)
5206
5208
5204
IR REJECT
5212
275MHz
FILTER
IMAGE REJECT COMPLEX MIXER
1200MHz
LC FILTER
GYRATOR OR
LC FILTER
5210
36 OR
44MHz
IF AGC
0-20dB
5202
1200MHz
FILTER TUNING
/4
44/36 MHz
FILTER TUNING
275MHz
FILTER TUNING
XTAL OSCILLATOR
PLL 1
PLL 2
PLL 2-NARROWBAND
925MHz
OAM:
L_{aw}=10kHz
f_{rcl}=100kHz
NTSC:
L_{aw}=2.5kHz
f_{rcl}=25kHz
L_{aw}=1MHz
f_{rcl}=10MHz
PLL 1-WIDEBAND
1250-2060MHz
10MHz
LPF
4822

FIG.53

CATV TUNER

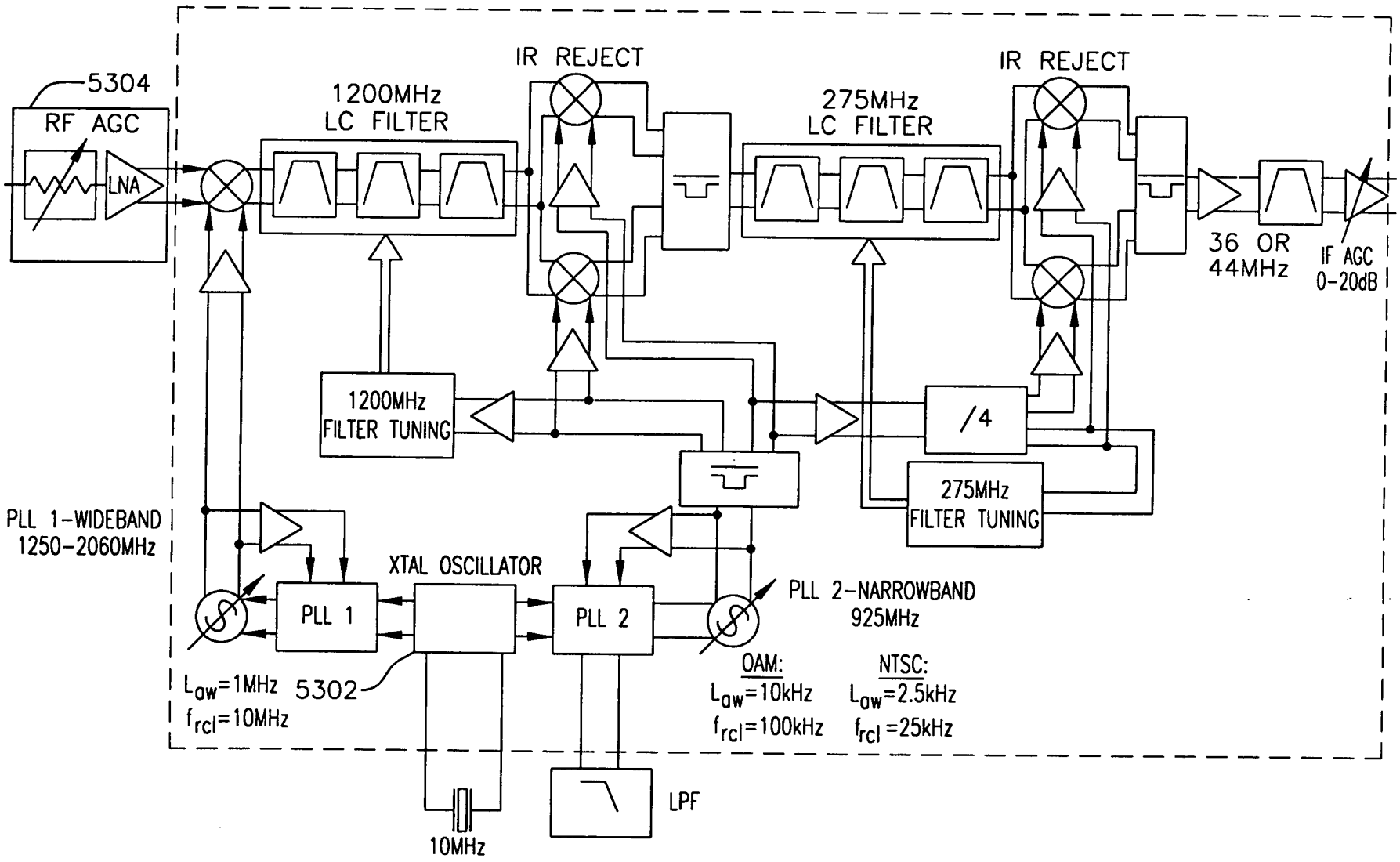
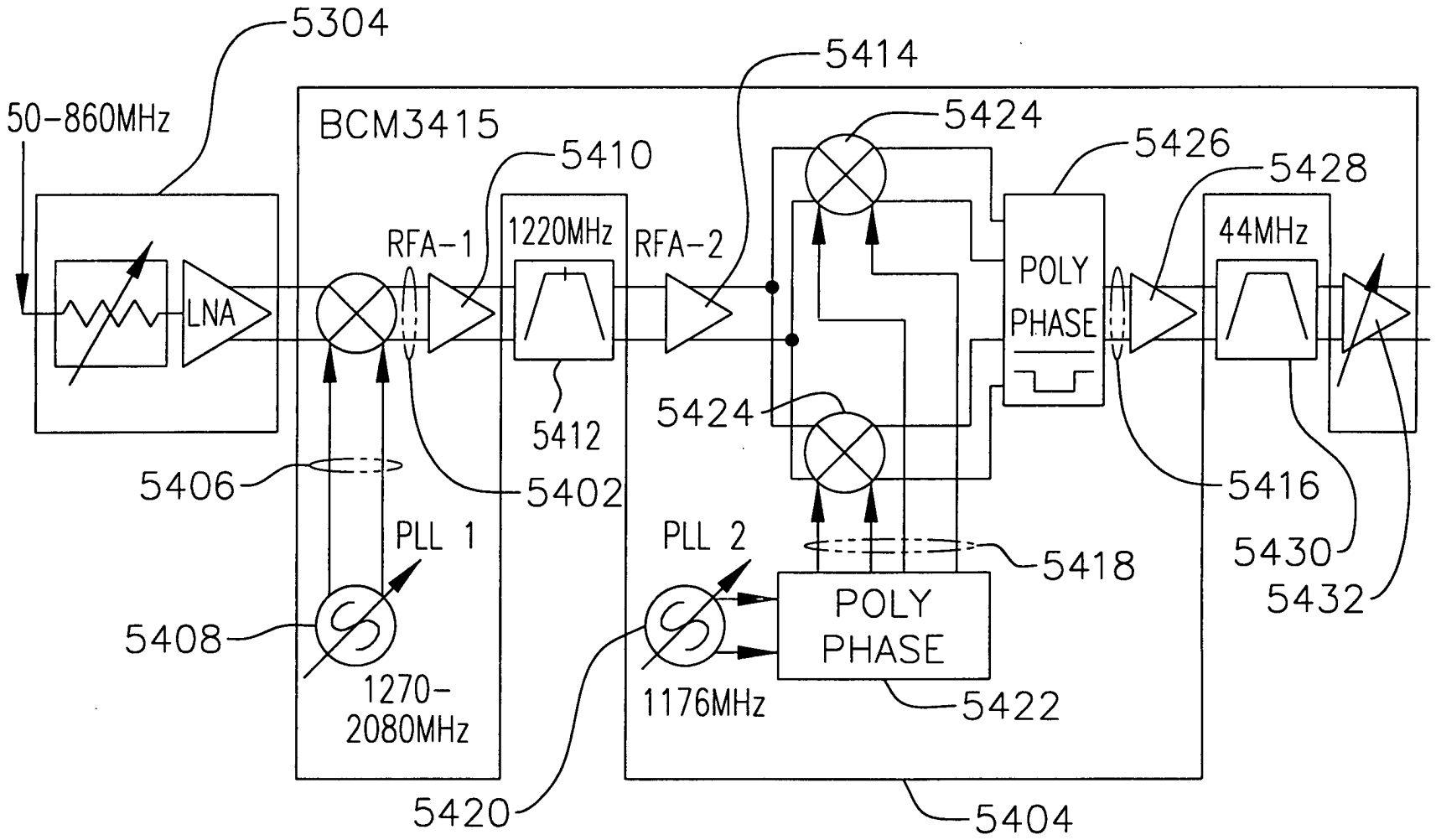


FIG.54


5304
50-860MHz
BCM3415
5414
5424
5426
5428
5410
RFA-1
1220MHz
RFA-2
POLY
PHASE
44MHz
LNA
5412
5424
5406
5402
5416
PLL 1
PLL 2
5418
5430
5432
5408
POLY
PHASE
1270-
2080MHz
1176MHz
5422
5420
5404